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Kite et al.

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(45) **Date of Patent: Jan. 26, 2016**

(54) **METHODS, SYSTEMS AND COMPUTER PROGRAM PRODUCTS FOR PLANNING RESOURCES BASED ON PRIMARY AND ALTERNATE LOCATION RELIEF STRATEGIES**

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(21) Appl. No.: **10/885,191**

(22) Filed: **Jul. 6, 2004**

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(51) **Int. Cl.**
G06Q 10/00 (2012.01)
G06Q 10/06 (2012.01)

(52) **U.S. Cl.**
CPC ***G06Q 10/06*** (2013.01); ***G06Q 10/06312*** (2013.01); ***G06Q 10/06315*** (2013.01)

(58) **Field of Classification Search**
USPC 705/7.11, 7.12
See application file for complete search history.

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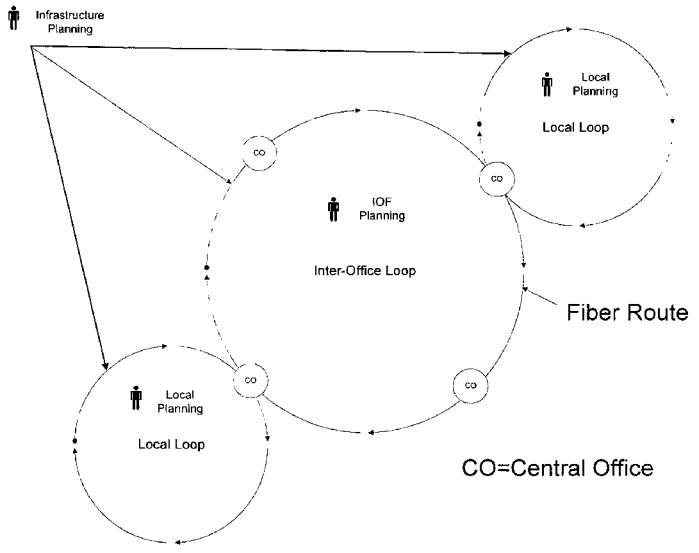
(57) **ABSTRACT**

In a computer-based method of planning resources, a plurality of Location Relief Strategy (LRS) plan data sets are imported into a resource planning application. The LRS plan data sets are associated with a resource need. One of the LRS plan data sets is defined as a primary LRS plan and at least one other one of the LRS plan data sets is defined as an alternate LRS plan. A resource plan is generated within the resource planning application based on the primary LRS plan and the alternate LRS plan. The primary LRS plan and the alternate LRS plan may each correspond to a plan for at least one of installing and retiring resources in a geographic area. The resources may, for example, be resources for carrying telecommunications in a geographic area.

19 Claims, 18 Drawing Sheets



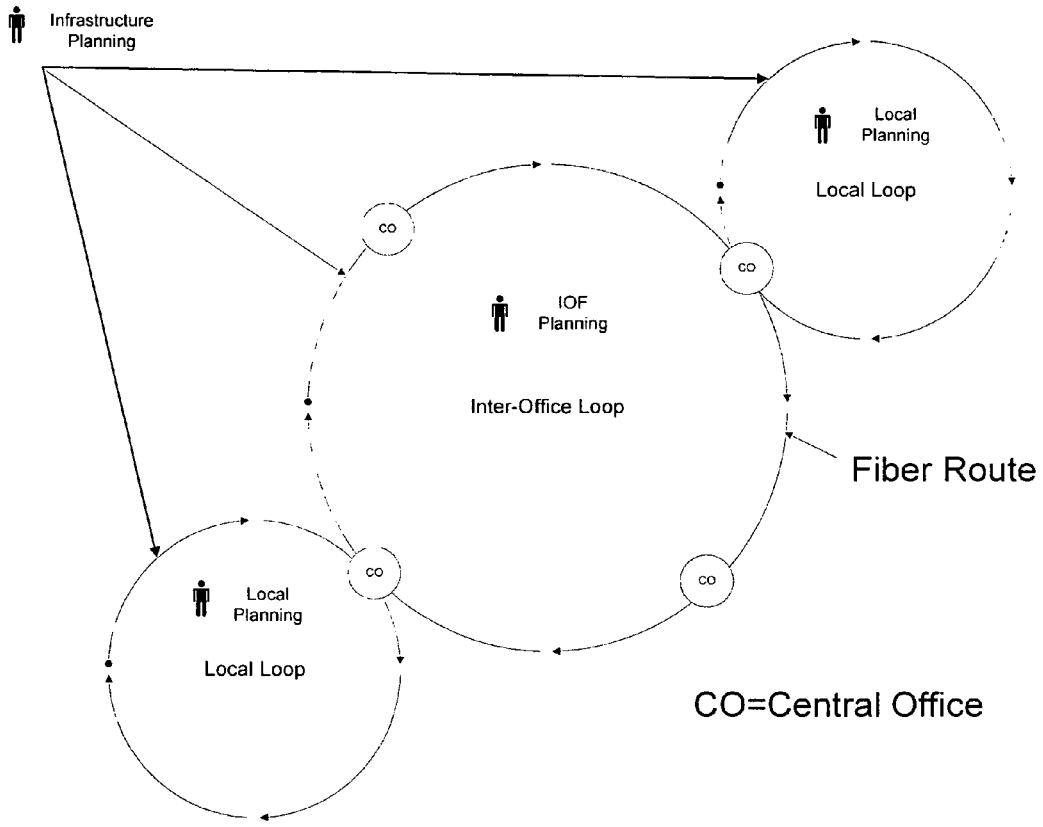

Infrastructure Planning
Local Planning
Local Loop
CO
CO
IOF Planning
Inter-Office Loop
Fiber Route
CO
CO
Local Planning
Local Loop
CO=Central Office

Figure 1

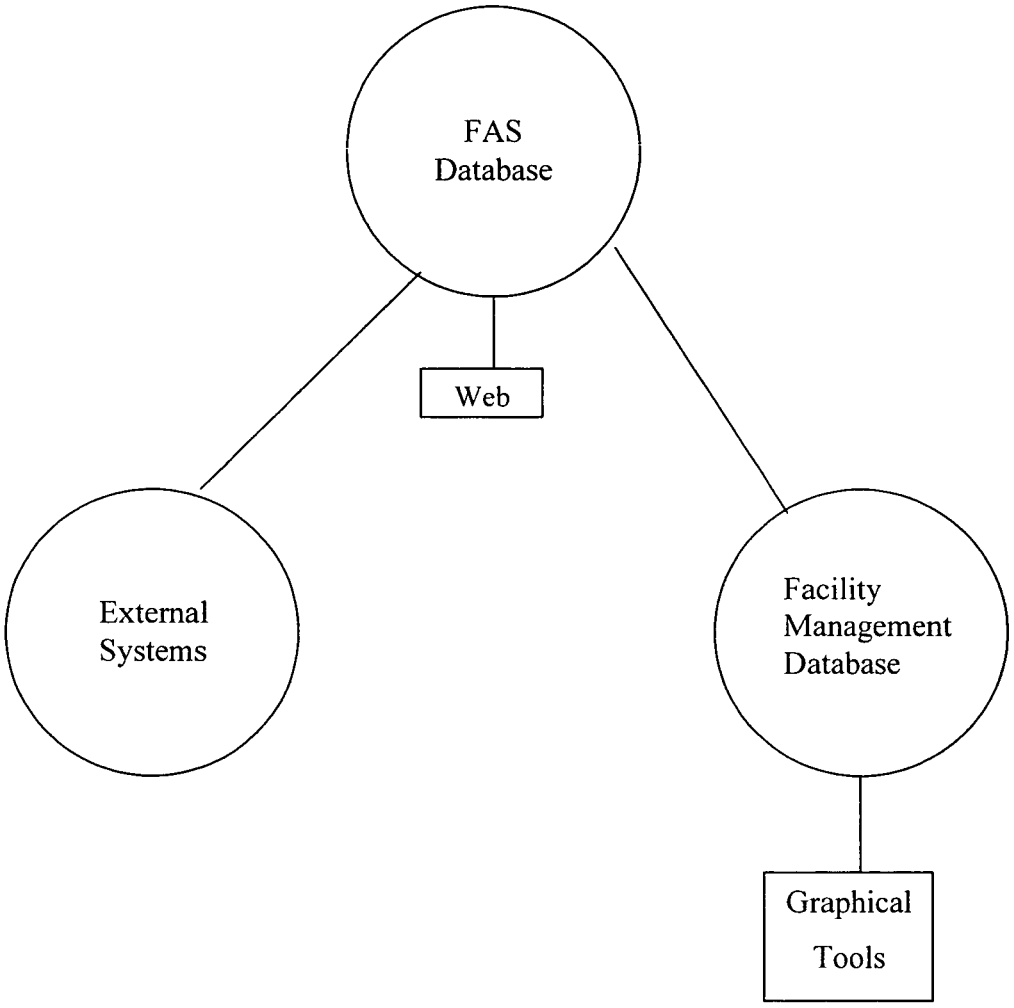

FAS
Database
Web
External
Systems
Facility
Management
Database
Graphical
Tools

Figure 2

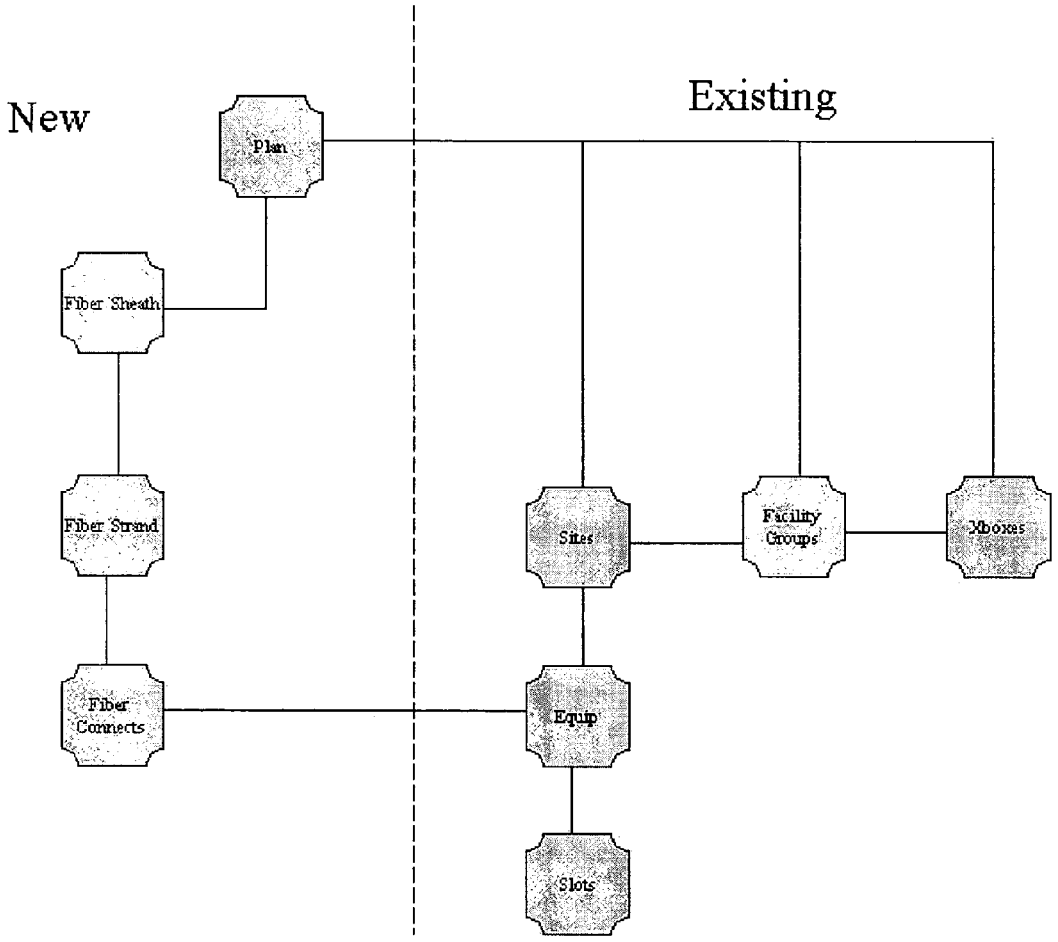

New
Existing
Plan
Fiber Sheath
Fiber Strand
Fiber Connects
Sites
Facility Groups
Xboxes
Equip
Slots

Figure 3

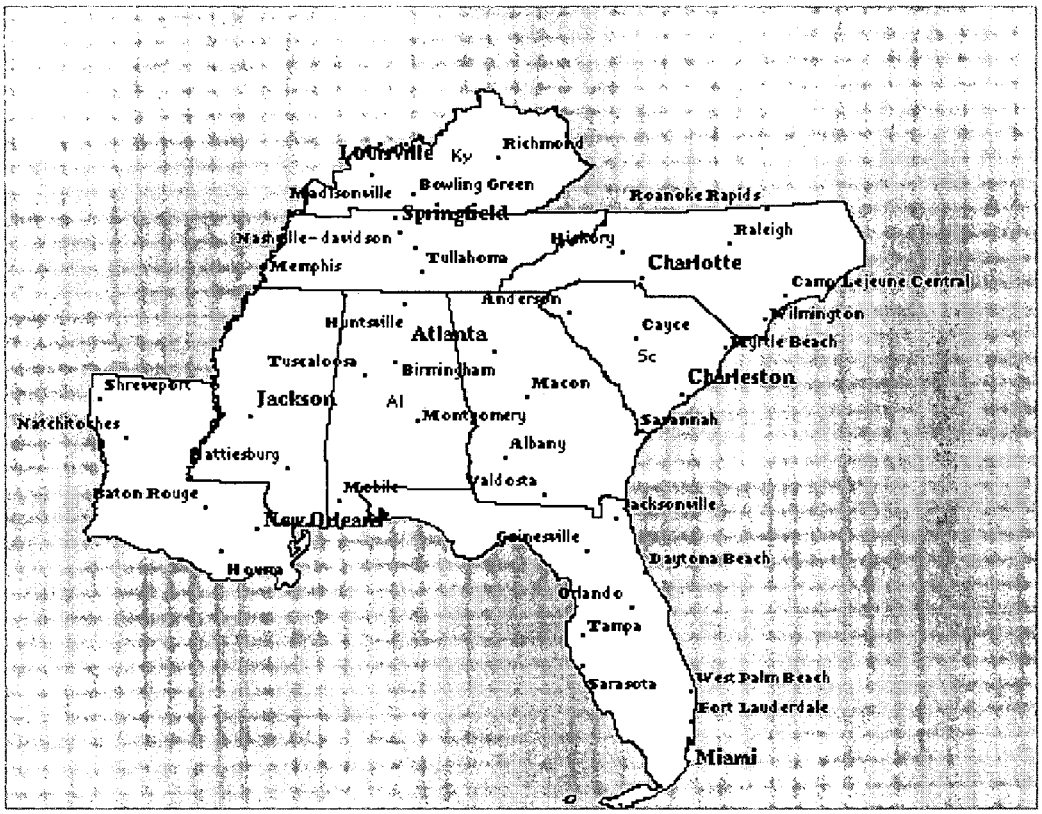

Louisville
Ky
Richmond
Bowling Green
Madisonville
Springfield
Roanoke Rapids
Raleigh
Nashville-davidson
Hickory
Tullahoma
Charlotte
Memphis
Camp Lejeune Central
Anderson
Wilmington
Huntsville
Atlanta
Cayce
Myrtle Beach
Tuscaloosa
Birmingham
Sc
Charleston
Shreveport
Macon
Jackson
Al
Montgomery
Savannah
Natchitoches
Albany
Hattiesburg
Baton Rouge
Mobile
Valdosta
Jacksonville
New Orleans
Gainesville
Daytona Beach
Houma
Orlando
Tampa
West Palm Beach
Sarasota
Fort Lauderdale
Miami

Figure 4

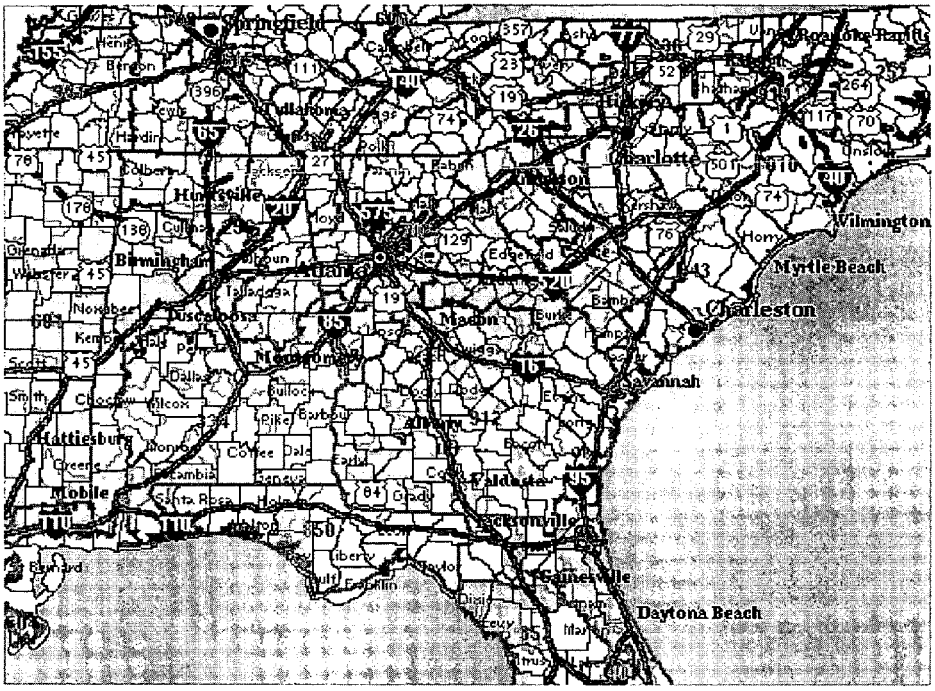


Figure 5

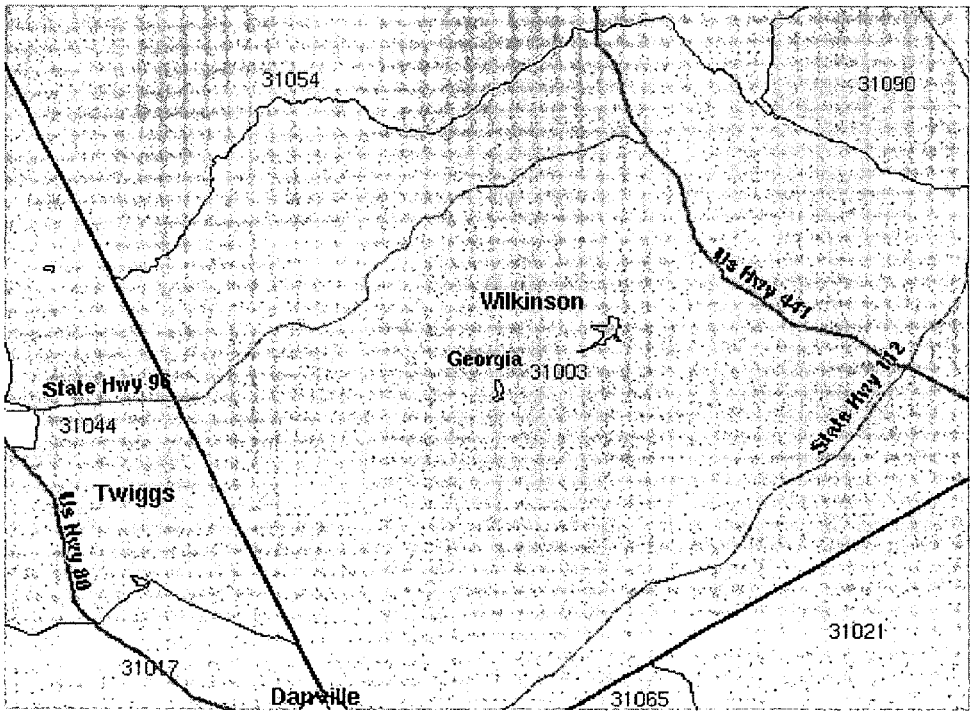


Figure 6

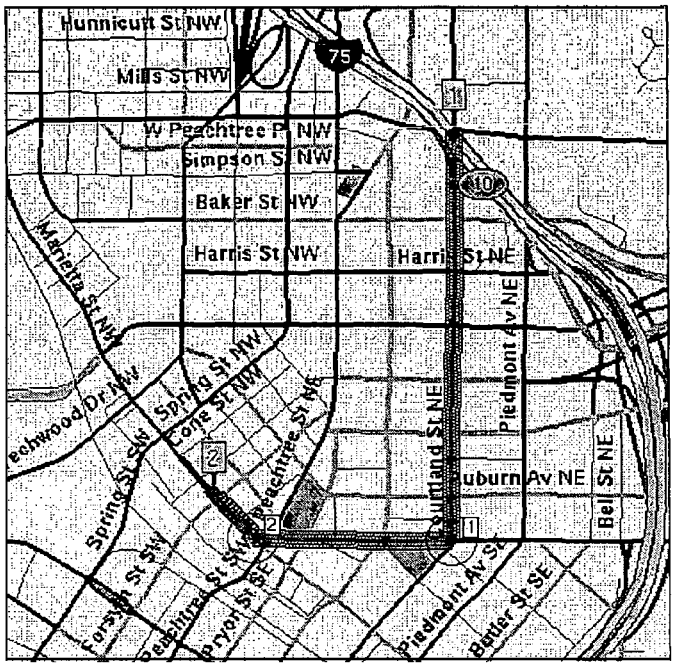


Figure 7

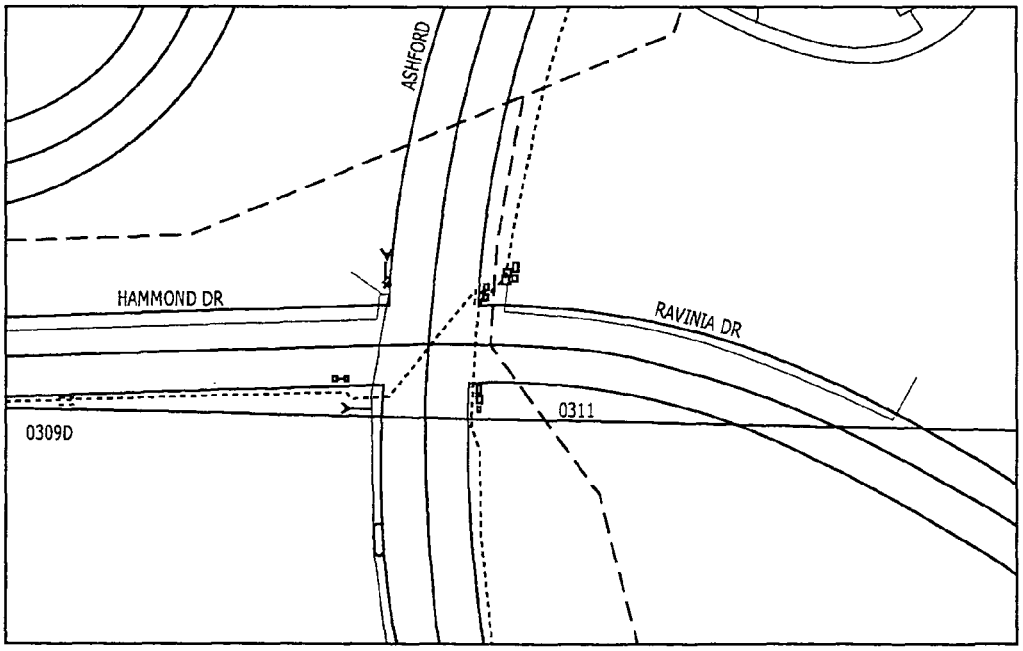


Figure 8

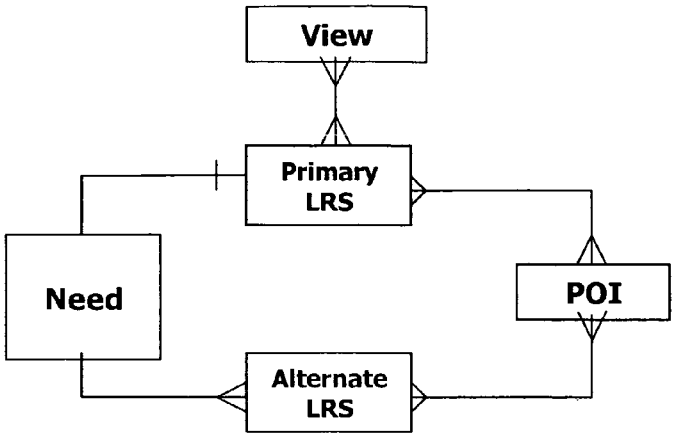


Figure 9

Location Relief Strategy

State Transition Diagram - Primary LRS

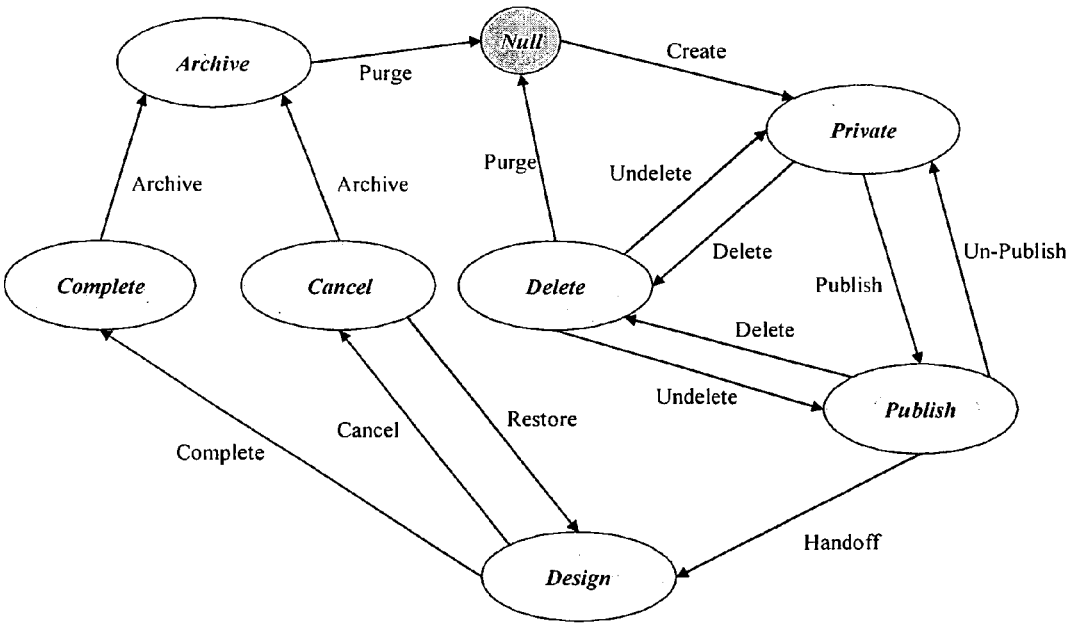


Figure 10

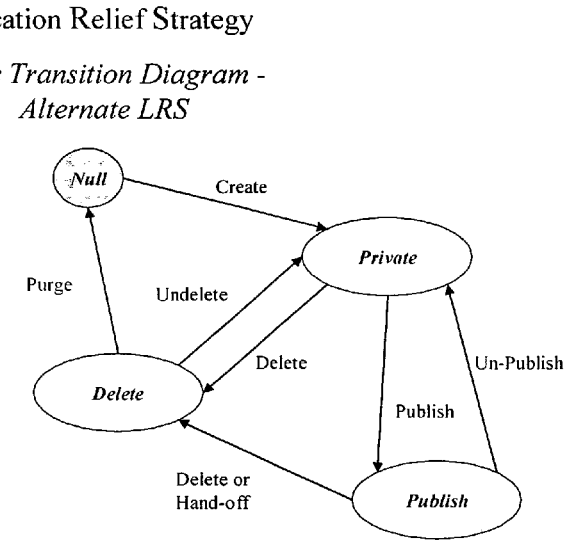


Figure 11

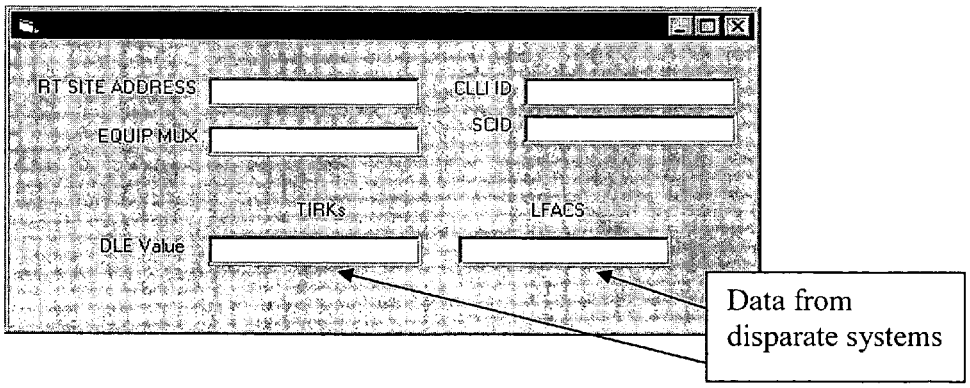


Figure 12

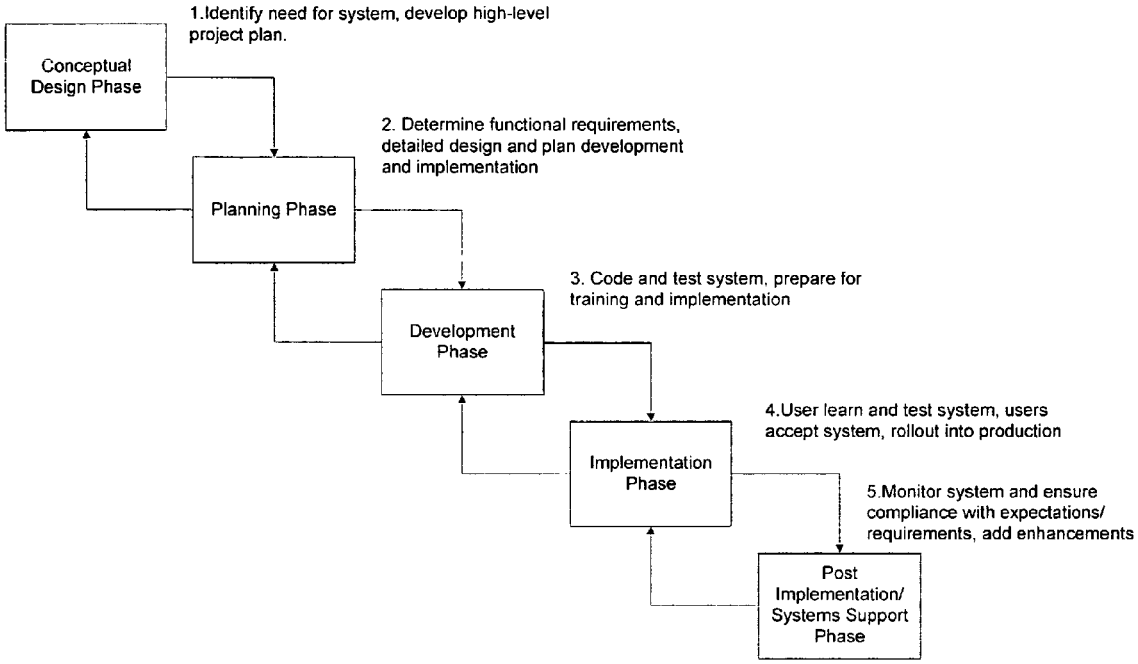

1.Identify need for system, develop high-level project plan.
Conceptual Design Phase
2. Determine functional requirements, detailed design and plan development and implementation
Planning Phase
3. Code and test system, prepare for training and implementation
Development Phase
4.User learn and test system, users accept system, rollout into production
Implementation Phase
5.Monitor system and ensure compliance with expectations/ requirements, add enhancements
Post Implementation/ Systems Support Phase

Figure 13

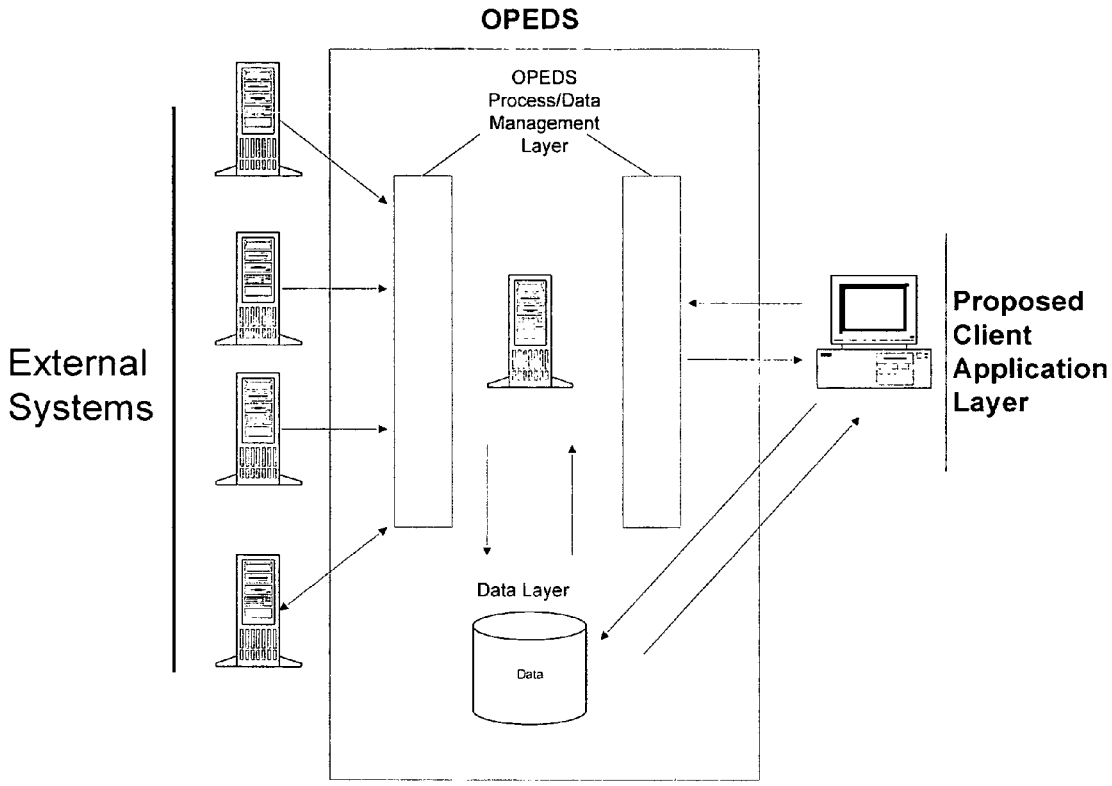

OPEDS
OPEDS Process/Data Management Layer
External Systems
Proposed Client Application Layer
Data Layer
Data

Figure 14

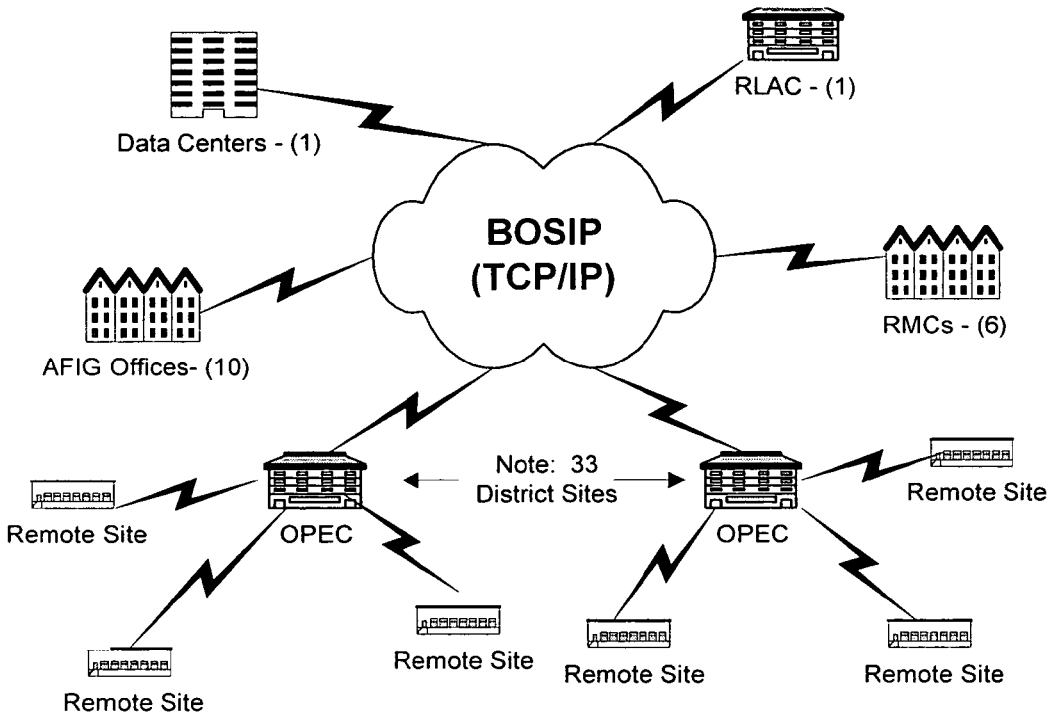

Data Centers - (1)
RLAC - (1)
BOSIP
(TCP/IP)
AFIG Offices- (10)
RMCs - (6)
Note: 33
District Sites
Remote Site
OPEC
OPEC
Remote Site
Remote Site
Remote Site
Remote Site
Remote Site

Figure 15

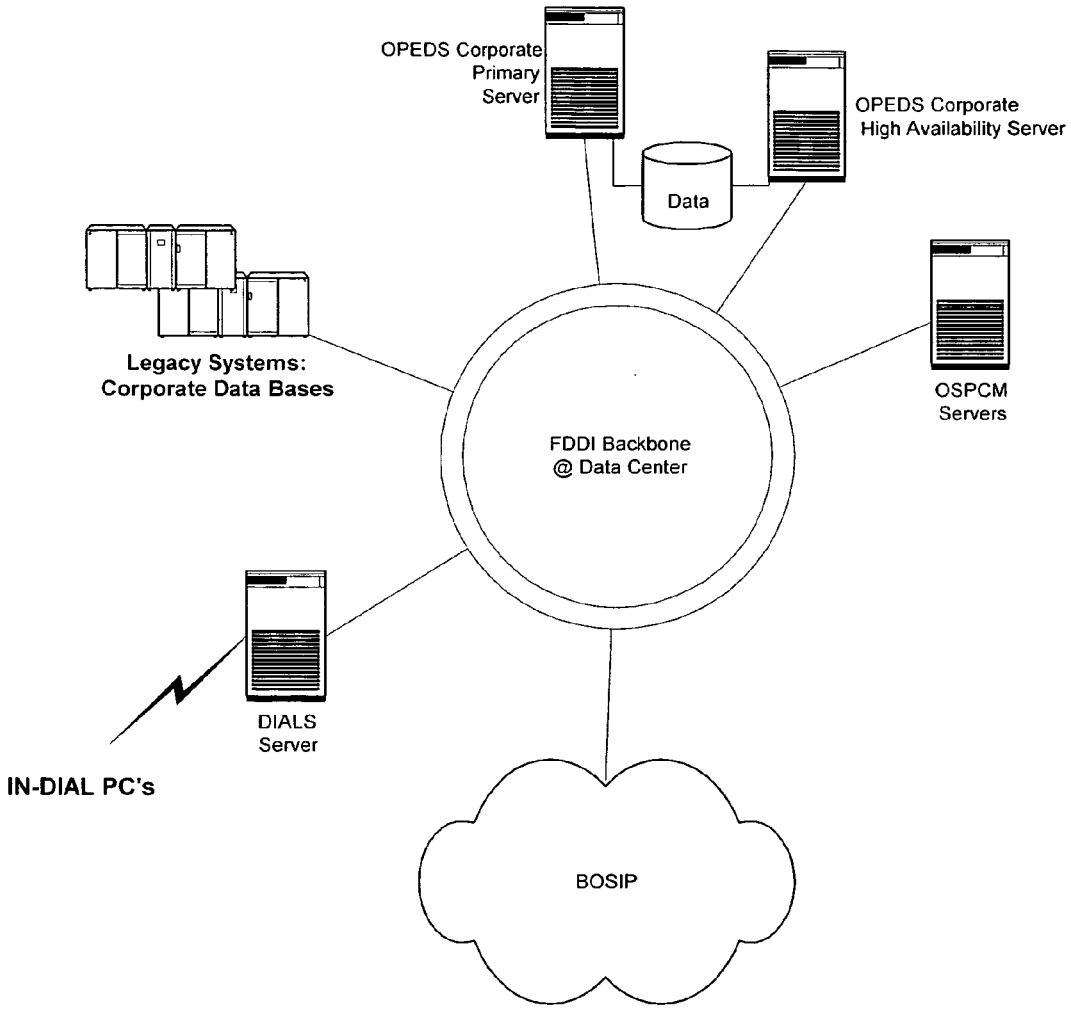

OPEDS Corporate Primary Server
OPEDS Corporate High Availability Server
Data
Legacy Systems: Corporate Data Bases
OSPCM Servers
FDDI Backbone @ Data Center
DIALS Server
IN-DIAL PC's
BOSIP

Figure 16

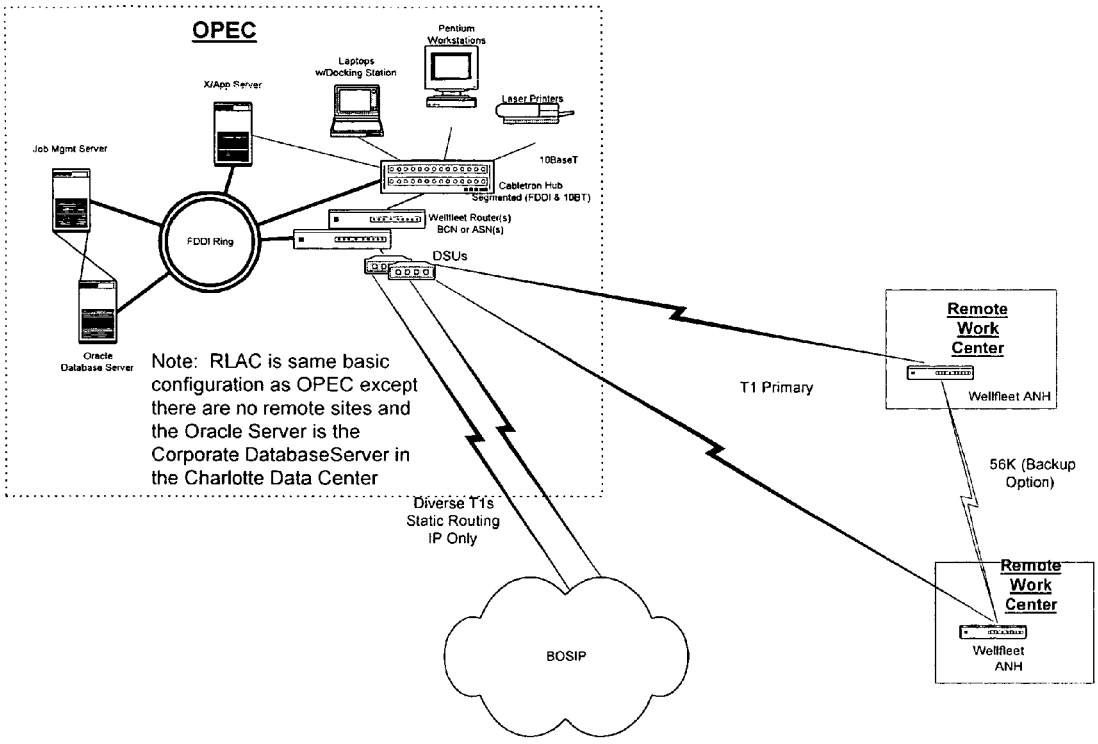
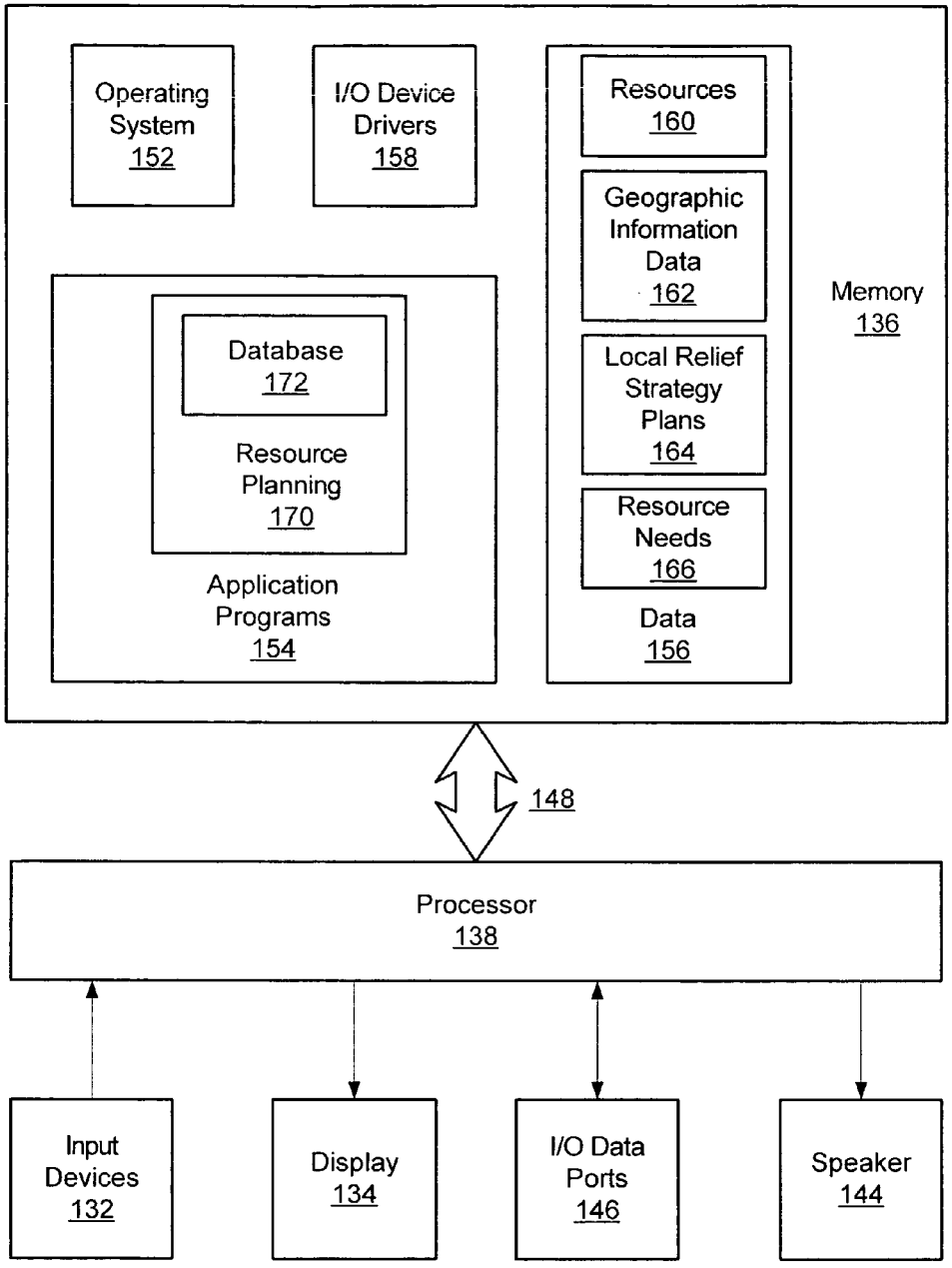

OPEC
Pentium Workstations
Laptops w/Docking Station
X/App Server
Laser Printers
Job Mgmt Server
10BaseT
Cabletron Hub Segmented (FDDI & 10BT)
Wellfleet Router(s) BCN or ASN(s)
FDDI Ring
DSUs
Oracle Database Server
Note: RLAC is same basic configuration as OPEC except there are no remote sites and the Oracle Server is the Corporate DatabaseServer in the Charlotte Data Center
T1 Primary
Remote Work Center
Wellfleet ANH
56K (Backup Option)
Diverse T1s Static Routing IP Only
BOSIP
Remote Work Center
Wellfleet ANH

Figure 17



Resource Planning System
100

Figure 18

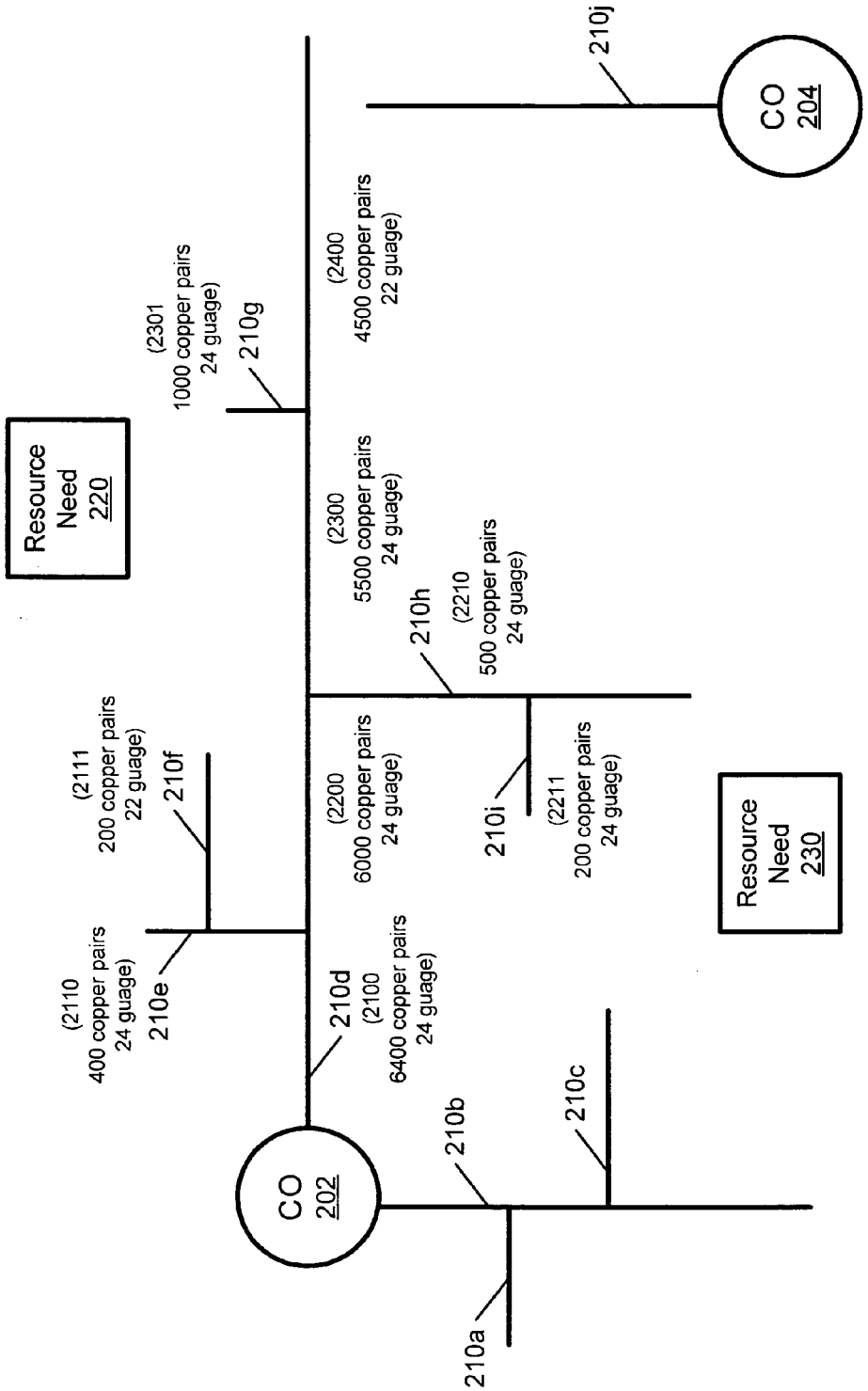

CO 202
CO 204
210a
210b
210c
210d
(2100 6400 copper pairs 24 guage)
210e
(2110 400 copper pairs 24 guage)
210f
(2111 200 copper pairs 22 guage)
210g
(2301 1000 copper pairs 24 guage)
210h
(2300 5500 copper pairs 24 guage)
210i
(2211 200 copper pairs 24 guage)
210j
(2400 4500 copper pairs 22 guage)
(2200 6000 copper pairs 24 guage)
(2210 500 copper pairs 24 guage)
Resource Need 220
Resource Need 230

Figure 19

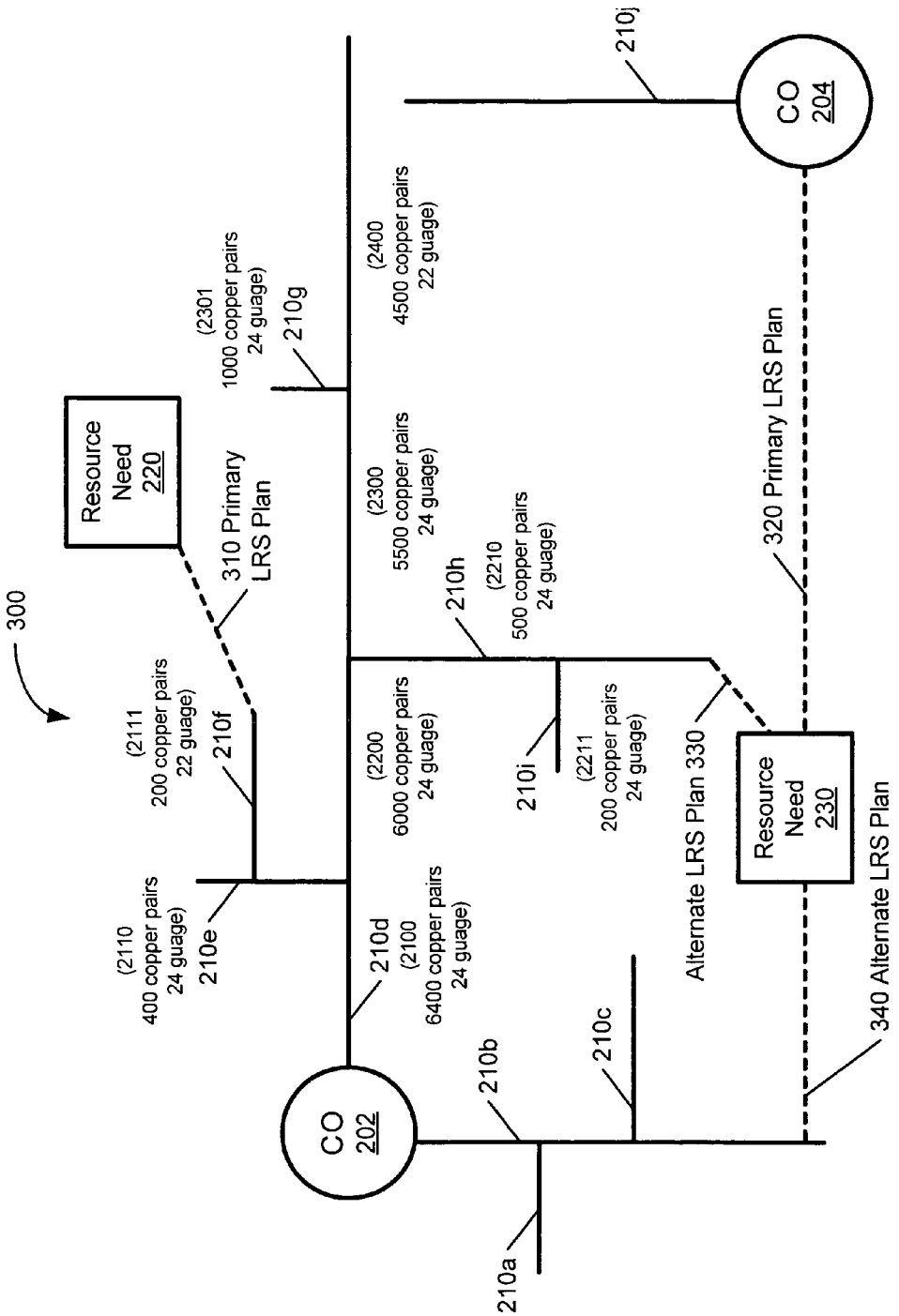

300
CO 202
CO 204
Resource Need 220
Resource Need 230
310 Primary LRS Plan
320 Primary LRS Plan
340 Alternate LRS Plan
Alternate LRS Plan 330
210a
210b
210c
210d
(2100 6400 copper pairs 24 guage)
210e
(2110 400 copper pairs 24 guage)
210f
(2111 200 copper pairs 22 guage)
210g
(2301 1000 copper pairs 24 guage)
210h
(2200 6000 copper pairs 24 guage)
210i
(2211 200 copper pairs 24 guage)
210j
(2300 5500 copper pairs 24 guage)
(2210 500 copper pairs 24 guage)
(2400 4500 copper pairs 22 guage)

Figure 20

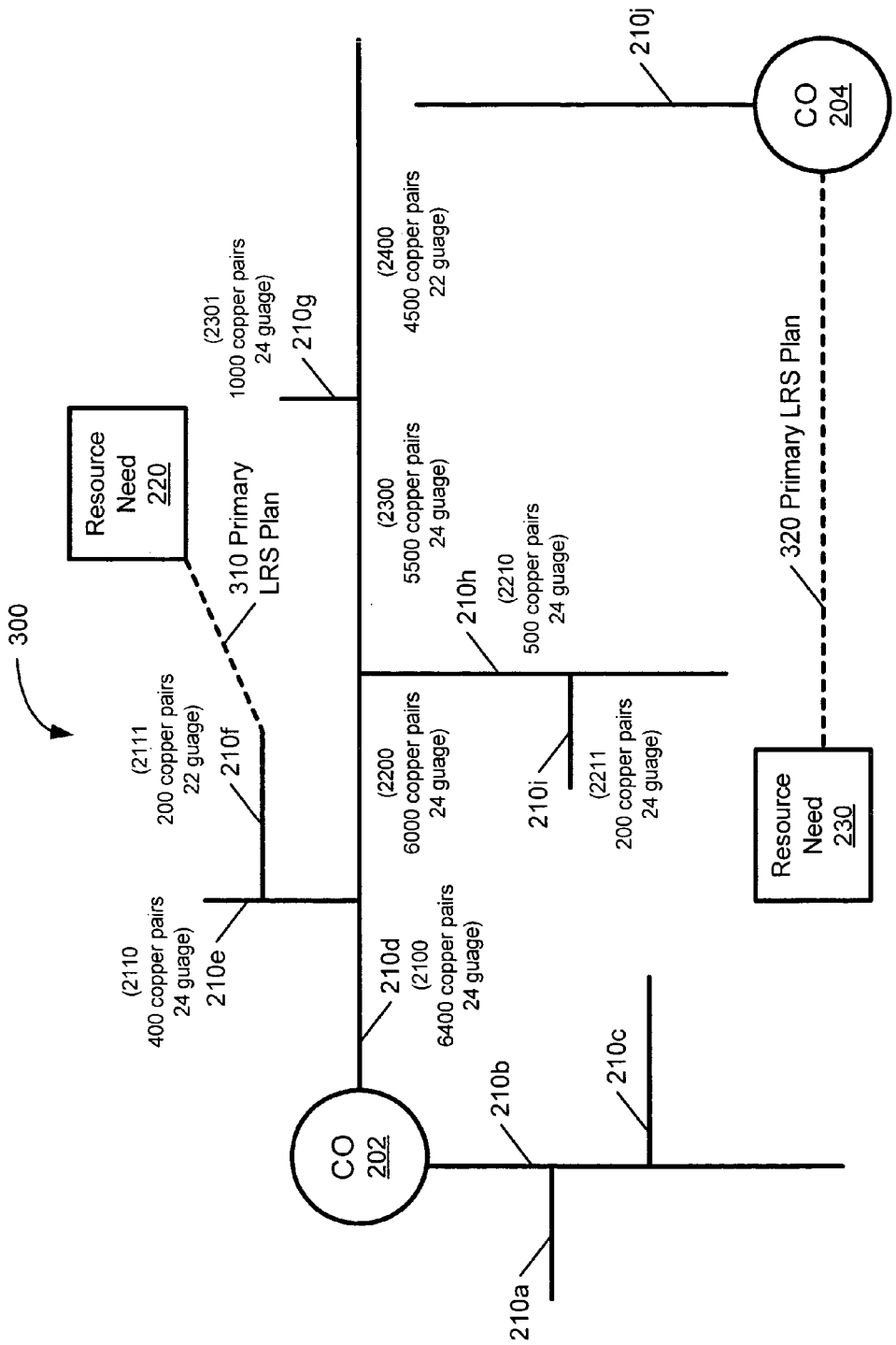

300
CO 202
CO 204
Resource Need 220
Resource Need 230
310 Primary LRS Plan
320 Primary LRS Plan
210a
210b
210c
210d
(2100 6400 copper pairs 24 guage)
210e
(2110 400 copper pairs 24 guage)
210f
(2111 200 copper pairs 22 guage)
210g
(2301 1000 copper pairs 24 guage)
210h
(2300 5500 copper pairs 24 guage)
(2200 6000 copper pairs 24 guage)
210i
(2210 500 copper pairs 24 guage)
(2211 200 copper pairs 24 guage)
210j
(2400 4500 copper pairs 22 guage)

Figure 21

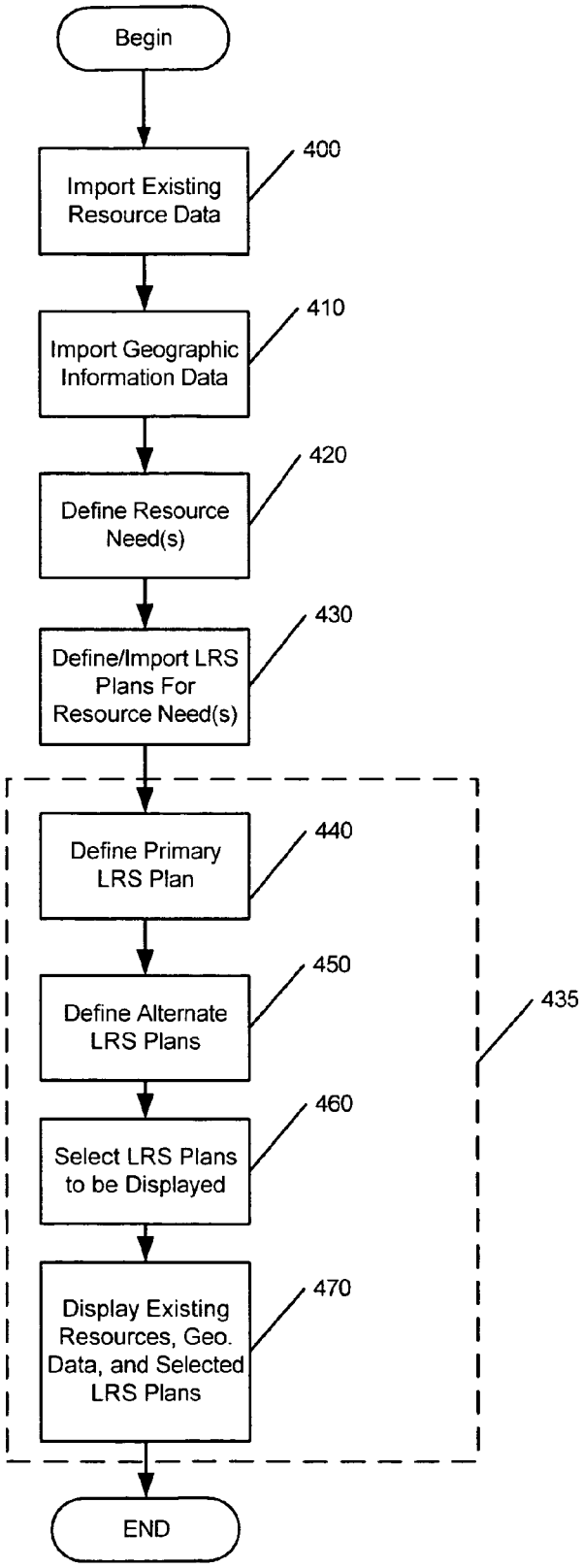

Begin
Import Existing Resource Data
400
Import Geographic Information Data
410
Define Resource Need(s)
420
Define/Import LRS Plans For Resource Need(s)
430
Define Primary LRS Plan
440
Define Alternate LRS Plans
450
Select LRS Plans to be Displayed
460
Display Existing Resources, Geo. Data, and Selected LRS Plans
470
435
END

Figure 22

METHODS, SYSTEMS AND COMPUTER PROGRAM PRODUCTS FOR PLANNING RESOURCES BASED ON PRIMARY AND ALTERNATE LOCATION RELIEF STRATEGIES

RELATED APPLICATION

This application claims the benefit of and priority to U.S. Provisional Patent Application No. 60/518,606, filed Nov. 7, 2003, the disclosure of which is hereby incorporated herein by reference as if set forth in its entirety.

FIELD OF THE INVENTION

The present invention relates to computer systems and more particularly to methods, systems, and computer program products for computer based resource planning.

BACKGROUND OF THE INVENTION

Planning resources, such as telephone network resources, generally involves determining what resource needs are expected over time, and examining the resources that are presently available and/or that need to be installed to satisfy the expected needs. Such planning once exclusively involved rendering resources that may be installed (i.e., planned resources) as mark-ups on transparent sheets, which were overlaid on paper geographic resource maps that included illustrations of existing resources. The transparent sheets and paper geographic maps then formed a location relief strategy for how existing and planned resources could be used to satisfy a resource need. Digital representations of geographic maps have increasingly become available through, for example, Geographic Information System (GIS) tools. Some GIS tools allow users to define and associate resources with geographic features of the digitized maps.

SUMMARY OF THE INVENTION

Some embodiments of the present invention provide computer-based methods of planning resources based on a resource need. A plurality of Location Relief Strategy (LRS) plan data sets are imported into a resource planning application. The LRS plan data sets are associated with a resource need. One of the LRS plan data sets is defined as a primary LRS plan and at least one other one of the LRS plan data sets is defined as an alternate LRS plan. A resource plan is generated within the resource planning application based on the primary LRS plan and/or the alternate LRS plan.

In some further embodiments of the present invention, the LRS plan data sets can be prioritized. The highest priority LRS plan data set can be selected as the primary LRS plan, and at least one other of the LRS plan data sets can be designated as the alternate LRS plan(s). The primary LRS plan may be changed to be an alternate LRS plan, and the alternate LRS plan may be changed to be a primary LRS plan. The primary LRS plan and/or the alternate LRS plan may be selectively displayed based on selections from a user. A plurality of LRS plan data sets may be associated with a plurality of resource needs, with one of the LRS plan data sets for each of the plurality of resource needs being defined as a primary LRS plan. A resource plan for each of the resource needs may be generated, and may be displayed to a user.

In some other embodiments of the present invention, the primary LRS plan and the alternate LRS plan may each correspond to a plan for installing and/or retiring resources in a geographic area. The resources may include resources for carrying telecommunications in a geographic area. A LRS plan may include, for example, a plan for installing a number of fiber optic communication lines and/or electrical communication lines at a geographic location.

Accordingly, more than one LRS plan may be associated with a resource need. When more than one LRS plan is associated with a resource need, one of the plans may be defined as a primary LRS plan and the other plan(s) may be defined as alternate LRS plan(s). The primary LRS plan may correspond to what a Long Term Planner perceives as a preferred way of satisfying the associated resource need, while the alternate LRS plans may correspond to what are perceived as less preferred ways. Such association of a preferred LRS plan and alternate LRS plans with a resource need may allow a Long Term Planner to define many different resource plans for meeting a resource need, and to designate a preferred resource plan while maintaining the other LRS plans for further use (e.g., documentation and/or analysis).

Other systems, methods, and/or computer program products according to embodiments will be or become apparent to one with skill in the art upon review of the following drawings and detailed description. It is intended that all such additional systems, methods, and/or computer program products be included within this description, be within the scope of the present invention, and be protected by the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a high-level view of the responsibilities of the exemplary user groups that may use a Fiber Management Tool (FMT) according to embodiments of the present invention.

FIG. **2** depicts a block diagram of the FMT.

FIG. **3** depicts a comparison between the "new" and "existing" objects in a FAS database.

FIG. **4** is a graphical view of a nine state region level provided by an exemplary FMT.

FIG. **5** is a graphical view of the multi-state region level provided by an exemplary FMT.

FIG. **6** is a graphical view of the wire center level provided by an exemplary FMT.

FIG. **7** is a high-level graphical view of the street level provided by an exemplary FMT.

FIG. **8** is a low-level graphical view of the street level provided by an exemplary FMT.

FIG. **9** depicts the relationships between exemplary components in a Location Relief Strategy (LRS).

FIG. **10** is a state transition diagram that depicts the functions of a LRS within a FMT.

FIG. **11** is a state transition diagram that depicts functions of an alternate LRS within a FMT.

FIG. **12** depicts an exemplary display of a returned data window and data discrepancies.

FIG. **13** depicts an exemplary systems development life cycle methodology followed for internally developed systems and major enhancements.

FIG. **14** depicts an exemplary three-tier architecture of an OPEDS system.

FIG. **15** depicts an OPEDS topology.

FIG. **16** depicts an OPEDS data center.

FIG. **17** depicts a typical district/RLAC.

FIG. **18** is a block diagram of a resource planning system suitable for use in embodiments of the present invention.

FIG. **19** depicts an exemplary display of existing resources and resource needs.

FIG. **20** depicts an exemplary resource plan that displays primary LRS plans and alternate LRS plans responsive to the resource needs shown in FIG. **2**.

FIG. **21** depicts an exemplary resource plan that displays only primary LRS plans responsive to the resource needs shown in FIG. **2**.

FIG. **22** is a flowchart illustrating operations for planning resources based one or more resource needs according to various embodiments of the present invention.

DETAILED DESCRIPTION

The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which illustrative embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

The detailed description of embodiments of the present invention is organized as follows:

1 Overview

As will be appreciated by one of skill in the art, the present invention may be embodied as a method, data processing system, or computer program product. Accordingly, the present invention may take the form of entirely software embodiments or embodiments combining software and hardware aspects. Furthermore, the present invention may take the form of a computer program product on a computer-usable storage medium having computer-usable program code embodied in the medium. Any suitable computer readable medium may be utilized including hard disks, CD-ROMs, optical storage devices, a transmission media such as those supporting the Internet or an intranet, or magnetic storage devices.

Computer program code for carrying out operations of the present invention may be implemented using programmable aspects of existing application programs such as, for example, application programs that may interface to, or be at least partially integrated with, Geographical Information System (GIS) tools and/or databases that can store geographic and resource information. Aspects of the computer program code may also be written in an object oriented programming language such as Java®, Smalltalk or C++ and/or using a conventional procedural programming languages, such as the "C" programming language. The program code may execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer. In the latter scenario, the remote computer may be connected to the user's computer through a local area network (LAN) or a wide area network (WAN), or the connection may be made to an external computer (for example, through the Internet using an Internet Service Provider).

The present invention is described below with reference to flowchart illustrations and/or block diagrams of methods, apparatus (systems) and computer program products according to embodiments of the invention. It will be understood that blocks of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer program instructions. These computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

These computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-readable memory produce an article of manufacture including instruction means which implement the function/act specified in the flowchart and/or block diagram block or blocks.

The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational steps to be performed on the computer or other programmable apparatus to

produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

Various embodiments of the present invention provide computer-based resource planning using a resource planning application. For purposes of illustration only, some of these embodiments are described herein in the context of planning communication resources, such as fiber optic communication lines and/or electrical communication lines. In particular, some embodiments of the present invention are described with regard to a Fiber Management Tool (FMT). It will be understood, however, that the present invention is not limited to planning of communication resources. Indeed, other resources, such as, but not limited to, gas lines, water lines, electrical lines, and/or television lines may be planned by other embodiments of the present invention. In general, the present invention is intended to encompass any technology and/or configuration capable of carrying out the operations described herein.

2 Introduction

Resource planning systems, methods and computer program products according to some embodiments of the invention, referred to herein, may be embodied in a Fiber Management Tool (FMT). The FMT can be a computer-based application that may provide an integrated view and monitoring of utilization of an existing fiber optic network and associated digital loop electronics, and may make this information more readily accessible to Network FACILITY PLANNERSs, Designers, Long Term Planners, and Construction Repair technicians, which may shorten information research time. The FMT may use land, facility, and equipment data stores. The FMT may run as an application on one or more servers, such as HP Unix servers that include Oracle for managing database attributes, and may include a DGN format for graphical files. The FMT application may display a graphical as well as a tabular view of data. The graphical layer may graphically display fiber network elements (ex. Fiber routes, remote terminals, central offices, equipment), supporting structures (ex. Conduit, manholes, poles) at defined geographical levels (ex. Wire center, state, district), and/or associated landbase features (ex. Streets, parcels, lakes, rivers).

The FMT may include the functionality of, or integrate with, existing Mechanized Facility Management databases, posting tools, and viewing tools to support additional fiber functionality: Inter-wire center connector, fiber splice feature, graphical location of fiber in Underground records, and CSA/Equipment Location feature. It may provide a development tools to automatically populate the facility data enhancements. The FMT may include tools to add existing fiber and CSA locations, along with key structure and connectivity features/attributes to the FMT SDO Database; both automatically from mechanized wire centers, and manually for non-mechanized wire centers. In addition to the IOF and feeder fiber network, FMT can also include distribution fiber.

The FMT may include a central repository for documenting Location Relief Strategies (LRS) plans created by FACILITY PLANNERSs and Long Term Planners. The FMT may include a planned data layer that allows definition of FACILITY PLANNERS, and tool for creating and maintaining future LRSs including fiber network, fiber strands, and associated DLE information. The FMT may include create a planning schematic from the existing network data, and may allow an automated "hand-off" of a selected LRS to a PM Tool system for the design process. Searches may be performed for primary and/or alternate LRSs.

The FMT may generate a land base for non-OPEDS converted wire centers with the location of central offices, equipment sites and x-boxes from the existing OPEDS land base data. It may provide mechanized processes and rules to load data and manage data conflicts from separate legacy system sources and user input from local records, and determine appropriate source to use to provide existing fiber and equipment attributes.

Potential users of the system and their basic needs are now described below, followed by a detailed discussion of various embodiments of the invention. The subsequent sections discuss the various embodiments in further detail and provide information about data, relationships, applicable business rules, and standards.

3 Description of Users and Information Needs

Purpose: The following section describes the various user groups that FMT can serve. Each section gives a brief overview of each user group's responsibility and their information needs.

Discussion: FMT's target users comprise of four groups. These groups are:

Local Planners (FACILITY PLANNERSs)

Infrastructure Loop Planners

Infrastructure Inter-Office (IOF) Planners

Construction

FIG. **1** provides a high-level view of the major user group's responsibilities.

3.1 Local Planners (Facility Planners)

FACILITY PLANNERS often answer requests for information from Marketing, Long Term Planners, and Inter-Office Planners. Local Planners have access to several sources of data. These include OPEDS Facility Database (MapViewer), LEIM, TIRKS, LFACS, and personal records, which makes them a de facto data repository for almost all of a telecommunication company's fiber optic assets. FMT can aggregate the information supplied by these external systems, providing Local Planners with a synchronized, consistent view of the data.

3.2 Long Term Planners

This group is responsible for high-level business planning, and analyzing metro-area and surrounding infrastructure. This group maintains information in personal records, stored primarily in spreadsheets (Microsoft Excel) and local databases (Microsoft Access). Long Term Planners provide Marketing with information. They also share information with Local Planning and Inter-Office Planners. Often, Long Term Planners require additional information, and personnel must contact Local Planning or Inter-Office Planners. FMT can provide Long Term Planners with timely information and eliminate the need for them to contact the other groups directly.

3.3 Infrastructure Inter-Office (IOF) Planners

Inter-Office Planners are responsible for designing the architecture for closed system, fiber-optic networks for busi-

nesses. A significant amount of their work revolves around the provisioning of advanced telephony services. Inter-Office Planners often rely on Long Term Planners and Local Planners to fulfill their information needs. Inter-Office Planners desire fiber route records, but have may only high-level schematics and assignment data. They often coordinate with Local Planners to make ring-routing decisions. FMT can provide Inter-Office Planners with fiber routing information and detailed schematics and streamline their interaction with other planning groups.

3.4 Construction

The Construction group has little direct involvement with managing fiber optic assets and is not involved in the information flow among the other groups. However, Construction is responsible for repair and splicing work. The Splicing Technicians in Construction deal with major problems (a cut cable) and minor problems (a missing jumper in a Light Cross Connect (LGX). Splicing Technicians currently have the ability to determine fault distances using an Optical Time Domain Reflectometer (OTDR). FMT can help them complete the "picture" of the problem by correlating this OTDR distance data with a geographic location. With geographic data available, Splicing Technicians can resolve problems more quickly.

4 Baseline Systems and Data

For the purpose of developing/implementing Fiber Management Tool, the following systems and data sets are assumed to exist:

Landbase

A landbase is a representation of streets, rights of ways, and various boundaries. This data may be stored in an Oracle database utilizing GIS software such as that provided by ESRI.

Facility

A mechanized facility database is a representation of the various facilities which comprise the telephone network. Facilities represented include, but are not limited to, poles, manholes, copper cables, terminals, and fiber cables. This graphical representation may be stored in a GIS database or in graphics files such as .dgn files.

Land & Facility Data Exchange

A Land and Facility Exchange is a means of synchronizing the two data stores to ensure that the facilities represented are shown in proper relation to the streets and rights of ways.

Equipment Database

The Equipment Database reconciles records of telephone equipment and assignment records from various databases. The reconciled records may be from systems such as LEIM, LFACS, and TIRKS.

5 Diagrams

5.1 High Level Relationship

In the development and design of Fiber Management System, a goal is to add new fiber information to existing by extracting data from various External Systems and Facility Management to display information in FAS via a Web interface. FIG. **2** represents the high level relationships for FMT.

5.2 Comparison of Systems

Currently in FAS through the FAS umbrella, the "existing" as shown in FIG. **3**, refers to the objects maintained in the FAS database. Within the existing objects, new data may be added. The objects depicted in FIG. **3** as "new" refer to the new objects to be incorporated i.e. (Fiber Sheath, Fiber Connect Fiber Strand and Plan) in the FAS database. A Location Relief Strategy (LRS) is a mechanism that is used to record future network relief strategies, providing the user with the ability to document network modifications, document the justification, and communicate this information electronically to downstream users, i.e. design engineering vendors and external systems. The LRS may be developed for immediate or future relief. Within the existing information base, the user can monitor cross-box fills, equipment, site, slot, wire center and their capacities. With the new proposed FAS functionality the user can be able to drill down to the fiber strand information and link to the existing information base and view graphically via the Fiber Management Tool.

6 Client Application Layer

Purpose: This section provides detailed information on FMT's application-layer embodiments, including functionality and expected behavior. The groupings are summarized in Table 1.

TABLE 1

Embodiment Groupings and Descriptions

Embodiment Groupings	Description
Login/Password	Describes a high-level architecture for login and password functions and user accessibility options.
Graphical and Tabular Fiber Capabilities	These embodiments describe the method for querying on specific criteria. They also indicate the functionality and types of data that FMT can provide to a user in a graphical or text format. Reporting are also included.
Planning Layer Functionality (LRS)	These embodiments indicate the functionality and types of data that FMT can provide for a user to plan future fiber network construction.
Utilize Data Supplied by External Systems	A brief summary of the functionality expected from FMT when reading data received from external systems.
Exit, Sessions, Recovery, and Cleanup	Summaries of the client interaction with the system as these functionalities are performed.
Performance Embodiments	These embodiments describe standard performance measures met by the system.

6.1 Login/Password

Users may be granted access to FMT via a unique combination of user identification (CUID, Common User ID) and password. FMT can maintain user permissions—including access to the planning layer access permissions on default views, etc.—in a user table stored in a database on a secure server. This table can provide administrators with the flexibility to organize users and associated permissions into logical groups.

6.2 Graphical and Tabular Fiber Capabilities

These embodiments indicate functionality needed to access information in FMT and manage the information pro-

cess. It also describes core functionality that FMT can provide to users.

6.2.1 Search/Find, View Graphical Elements

6.2.1.1 Provide Views and Functions in a Seamless Environment

Embodiment	Provide accurate graphical views of geographical features and network facilities in a seamless environment.
Description	Graphical views and fiber strand connectivity shall be maintained across wire center, district, state, and other boundary types.

6.2.1.2 Provide Default Views

Embodiment	Provide support for default views containing a defined set of fiber network elements (facilities) and geographical features (landbase) based upon the type of view presented.
Description	The GUI interface can provide other geographical and fiber network elements that can be shown based upon a user's request (i.e. turn features on or off).
Data	At a minimum, FMT can provide the following default views: Nine State Region View Multi-State View State View District View Wire Center View Street View

6.2.1.3 Specify Scaling Capability

Embodiment	Ability to define the scale of display and the ability to override the default scale assigned to a default view.
Description	As the scale of the view changes, the level of detail for land and facility elements, as noted via symbology, can also change in a corresponding manner. Views and network symbology can map to current OPEDS, .LND, landbase, and .DGN in the facilities models previously described. When the user changes the scale, FMT can toggle between default views (e.g., if the user is at the Nine-State view and changes the scale by zooming in, FMT can, at a defined scale point, switch to the Multi-State view).
Data	FMT can provide the user with the ability to specify the view and scale via the following manners: Map to Ground Ratio (e.g., 1:100) Map Unit equals Ground Distance (e.g., 1 inch to 1 mile, or 1 kilometer) Magnification Factor (e.g., zoom-in or zoom-out from a centered point on the screen) Select default views by indicating appropriate attributes (e.g., user selects Wire Center view and specifies a Wire Center or user can select multi-wire center view; user selects Street view by indicating Wire Center and street intersection) Defining the Area of Interest by drawing a polygon (e.g., user draws a polygon at a Wire Center view, or multi-wire center view, and FMT shows a street level view the specified area)

6.2.1.4 Specify Search Criteria

Embodiment	Provide the user with the ability to select specific parameters for querying data.
Description	The parameters can provide the user with the ability to define the scope of the query from a broad search (e.g., all equipment at a Central Office (CO)) to a more precise search (e.g., a specific item of equipment at a CO).

6.2.1.5 Provide Additional Search Functions

Embodiment	Provide the user with the ability to further refine a query by utilizing Boolean searches.
Description	Users can base the searches on an item or group of items against a value or range of values (e.g., all sheaths greater than 10000 feet). This functionality is available for all data entities and attributes. In addition, the system can provide the user with the ability to query on wildcards (e.g., "*", "%"), in each data entry field to broaden or narrow the results of the search. For example, a user may want to find all roads that start with "Peach", entering "Peach%" in the query field.

6.2.1.6 Format Query Results

Embodiment	Provide the user with the ability to further view the results of a query in both a graphical and/or tabular format.
Description	If a set of required data is maintained in multiple external systems and their values are different, FMT can indicate

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	the source and values of each conflicting data set.

6.2.1.7 Display Multiple Query Results

Embodiment	Allow the user with the ability to display multiple query results.
Description	For example, a user may perform a loop trace on a fiber strand, then to perform a second one - while maintaining the original loop trace on screen - in order to compare the results.

6.2.1.8 Define Default Views

Embodiment	Show a defined set of land features and network facilities for each default view.
Description	Many of these items may be selectable by the user to view information and initiate a data query.

Table 2 indicates the format of the information provided for each default view.

TABLE 2

Objects	Indicates the network facility items that FMT can display at the default view
Behavior	Indicates the selection method (passover or click) that a user can perform to access information about the object
Attributes Displayed	Indicates the data attributes that FMT can display if the object is selected
Default View	(Y = Yes) Indicates that FMT can automatically display the object in the default view (N = No) Indicates that FMT can not automatically display the object in the default view, but is available at a user's request (e.g., user may turn object on or off)
Additional Information	Provides information unique to the object

6.2.1.8.1 Default View by User Type

FMT can provide the administrative ability to associate a user with a specific role type and geographic area. Examples of role types include, but are not limited to, Facility Planners, InterOffice Planners, etc. Examples of geographical areas include, but are not limited to, State, District and Wire Center. Based on users' defaults, FMT can provide default functionality and graphical views.

6.2.1.8.2 Nine State Region

FMT can provide a default view of a Nine-State region, which includes Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee. Other regions may be provided. FIG. **4** suggests this concept.

Objects	Behavior	Attributes Displayed	Default View	Additional Information
		Land		
State Boundaries	N/A	N/A	Y	
State Names (Abbreviation)	N/A	N/A	Y	
District Boundaries	Passover	District Name	Y	
	District Area			
Major Cities	N/A	N/A	Y	
Interstate Highways, with designation #	N/A	N/A	N	
Other Territory	N/A	N/A	N	
		Facilities		
Fiber Routes (IOF only)	Click	Fiber Sheath Attributes of first sheath	N	Shown as a result of a query
Fiber Strands (IOF and Loop)	Passover	Fiber Strand Name	N	Shown as a result of a query
	Click	Fiber Strand Attributes		
Central Office Locations	Passover	Central Office Name	N	
	Click	Central Office Attributes		
Central Office Names	N/A	N/A	N	If Central Office Name is displayed, Central Office Location passover feature is disabled

6.2.1.8.3 Multi State

FMT can provide a default multi-state view comprising an originating state and all the states that border the originating state. FIG. **5** suggests this concept.

Objects	Behavior	Attributes Displayed	Default View	Additional Information
		Land		
State Boundaries	N/A	N/A	Y	
State Names (Abbreviation)	N/A	N/A	Y	
District Boundaries	Passover	District Name	Y	
	District Area			
Interstate Highways, with designation #	N/A	N/A	Y	
State Highways, with designation #	N/A	N/A	Y	
Major Cities	N/A	N/A	Y	
Other territory	N/A	N/A	Y	
Numbered Planning Area (NPA)	Click	NPA #	N	
		Facilities		
Fiber Routes (IOF only)	Click	Fiber Sheath Attributes of first sheath	N	Shown as a result of a query
Fiber Strands (IOF and Loop)	Passover	Fiber Strand Name	N	Shown as a result of a query
	Click	Fiber Strand Attributes		
Central Office Locations	Passover	Central Office Name	N	
	Click	Central Office Attributes		
Central Office Names	N/A	N/A	N	If Central Office Name is displayed, Central Office Location passover feature is disabled

6.2.1.8.4 Single State

FMT can provide a default single state view comprising a single state and partial boundaries of adjacent states. FIG. **5** illustrates the concept.

Objects	Behavior	Attributes Displayed	Default View	Additional Information
		Land		
State Boundaries	N/A	N/A	Y	
State Names (Abbreviation)	N/A	N/A	Y	
District Boundaries	N/A	N/A	Y	
District Names	N/A	N/A	Y	
Interstate Highways, with designation #	N/A	N/A	Y	
State Highways, with designation #	N/A	N/A	Y	
Major Cities	N/A	N/A	Y	
Water Bodies	Passover	Water Body Name	Y	
Other territory	N/A	N/A	Y	
County Boundaries	Click	County Name	N	
County Names	N/A	N/A	N	If County Name is displayed, County Boundary click feature is disabled
Numbered Planning Area (NPA)	Click	NPA #	N	
Exchange	Click	Exchange #	N	
Local Access Toll Area (LATA)	Click	LATA #	N	

-continued

Objects	Behavior	Attributes Displayed	Default View	Additional Information
Airports	N/A	N/A	N	
Landmarks	N/A	N/A	N	
		Facilities		
Fiber Routes (IOF only)	Click	Fiber Sheath Attributes of first sheath	Y	
Fiber Strands (IOF and Loop)	Passover	Fiber Strand Name	N	Shown as a result of a query
	Click	Fiber Strand Attributes		
Central Office Locations	Passover	Central Office Name	N	
	Click	Central Office Attributes		
Central Office Names	N/A	N/A	N	If Central Office Name is displayed, Central Office Location passover feature is disabled

6.2.1.8.5 District

FMT can provide a default District view comprising the District and partial boundaries of adjacent Districts. FIG. **5** illustrates the concept.

Objects	Behavior	Attributes Displayed	Default View	Additional Information
		Land		
State Boundaries	N/A	N/A	Y	
State Names (Abbreviation)	N/A	N/A	Y	
District Boundaries	N/A	N/A	Y	
District Names	N/A	N/A	Y	
Wire Center Boundaries	Passover	Wire Center Name	Y	
Interstate Highways, with designation #	N/A	N/A	Y	
State Highways, with designation #	N/A	N/A	Y	
Major Cities	N/A	N/A	Y	
Water Bodies	Passover	Water Body Name	Y	
Other territory	N/A	N/A	Y	
County Boundaries	Click	County Name	N	
County Names	N/A	N/A	N	If County Name is displayed, County Boundary click feature is disabled
City Boundaries	Click	City Name	N	
City Names	N/A	N/A	N	If City Name is displayed, City Boundary passover feature is disabled
Zip Code Boundaries and Zip Code	N/A	N/A	N	
Numbered Planning Area (NPA) Boundaries and NPA #	N/A	N/A	N	
Exchange Boundaries and Exchange #	N/A	N/A	N	
Local Access Toll Area (LATA) Boundaries and LATA #	N/A	N/A	N	
Airports	N/A	N/A	N	
Landmarks	N/A	N/A	N	

-continued

Objects	Behavior	Attributes Displayed	Default View	Additional Information
		Facilities		
Fiber Routes (IOF only)	Click	Fiber Sheath Attributes of the first sheath	Y	
Fiber Strands (IOF and Loop)	Passover	Fiber Strand Name	N	Shown as result of a query
	Click	Fiber Strand Attributes		
Central Office Locations	Passover	Central Office Name	Y	
	Click	Central Office Attributes		
Central Office Names	N/A	N/A	N	If Central Office Name is displayed, Central Office Location passover feature is disabled

6.2.1.8.6 Wire Center

FMT can provide a default single Wire Center view comprising the Wire Center and partial boundaries of adjacent Wire Centers. FIG. **6** suggests the concept.

Objects	Behavior	Attributes Displayed	Default View	Additional Information
		Land		
State Boundaries	N/A	N/A	Y	
State Names (Abbreviation)	N/A	N/A	Y	
District Boundaries	N/A	N/A	Y	
District Names	N/A	N/A	Y	
Wire Center Boundaries	N/A	N/A	Y	
Wire Center Names	N/A	N/A	Y	
Interstate Highways, with designation #	N/A	N/A	Y	
State Highways, with designation #	N/A	N/A	Y	
Major Cities	N/A	N/A	Y	
Water Bodies	Passover	Water Body Name	Y	
Other territory	N/A	N/A	Y	
City Boundaries	N/A	N/A	Y	
City Names	N/A	N/A	Y	
Railroads	N/A	N/A	Y	
County Boundaries	Click	County Name	N	
County Names	N/A	N/A	N	If County Name is displayed, County Boundary click feature is disabled
Zip Code Boundaries and Zip Code	N/A	N/A	N	
Numbered Planning Area (NPA) Boundaries and NPA #	N/A	N/A	N	
Exchange Boundaries and Exchange #	N/A	N/A	N	
Local Access Toll Area (LATA) Boundaries and LATA #	N/A	N/A	N	
Tax Area Boundaries and Tax #	N/A	N/A	N	

-continued

Objects	Behavior	Attributes Displayed	Default View	Additional Information
Airports	N/A	N/A	N	
Landmarks	N/A	N/A	N	
		Facilities		
Fiber Routes (IOF and Loop)	Click	Fiber Sheath Attributes of the first sheath	Y	
Fiber Strands (IOF and Loop)	Passover	Fiber Strand Name	N	Shown as result of a query
	Click	Fiber Strand Attributes		
Central Office Locations	Click	Central Office Attributes	Y	
Central Office Names	N/A	N/A	Y	
Remote Terminal Locations	Passover	Remote Terminal Name	N	Shown as the result of a query
	Click	Remote Terminal Attributes		
Remote Terminal Names	N/A	N/A	N	If Remote Terminal Name is displayed, Remote Terminal Location passover feature is disabled
Conduit Runs	Click	Conduit Attributes	N	Currently, this information is available only in the Western States

6.2.8.1.7 Street Level

FMT can provide a default view comprising street segments. FIG. **7** and FIG. **8** suggest the concept.

Objects	Behavior	Attributes Displayed	Default View	Additional Information
		Land		
State Boundaries	N/A	N/A	Y	
State Names (Abbreviation)	N/A	N/A	Y	
District Boundaries	N/A	N/A	Y	
District Names	N/A	N/A	Y	
Wire Center Boundaries	N/A	N/A	Y	
Wire Center Names	N/A	N/A	Y	
Interstate Highways	N/A	N/A	Y	
State Highways	N/A	N/A	Y	
Major Cities	N/A	N/A	Y	
Water Bodies	Passover	Water Body Name	Y	
Other territory	N/A	N/A	Y	
City Boundaries	N/A	N/A	Y	
City Names	N/A	N/A	Y	
Street Right of Ways	N/A	N/A	Y	
Street Names	N/A	N/A	Y	
Railroads	N/A	N/A	Y	
Parcels	N/A	N/A	N	
County Boundaries	Click	County Name	N	
County Names	N/A	N/A	N	If County Name is displayed, County Boundary click feature is disabled
Zip Code Boundaries and Zip Code	N/A	N/A	N	
Numbered Planning Area (NPA)	N/A	N/A	N	

-continued

Objects	Behavior	Attributes Displayed	Default View	Additional Information
Boundaries and NPA #				
Exchange Boundaries and Exchange #	N/A	N/A	N	
Local Access Toll Area (LATA) Boundaries and LATA #	N/A	N/A	N	
Tax Area Boundaries and Tax #	N/A	N/A	N	
Communities	N/A	N/A	N	
Airports	N/A	N/A	N	
Parks-Lands	N/A	N/A	N	
Landmarks	N/A	N/A	N	
		Facilities		
Fiber Routes (IOF and Loop)	Click	Fiber Sheath Attributes of first sheath	Y	
Fiber Strands	Passover	Fiber Strand Name	N	Shown as result of a query
	Click	Fiber Strand Attributes		
Loops and Length	N/A	N/A	Y	
Splices and Length	N/A	N/A	Y	
Poles	N/A	N/A	Y	
Manholes and Names	N/A	N/A	Y	
Hand Holes and Names	N/A	N/A	Y	
Conduit Runs	Click	Conduit Attributes	Y	Currently, this information is available only in the Western States
Central Office Locations	Click	Central Office Attributes	Y	
Central Office Names	N/A	N/A	Y	
Remote Terminal Locations	Click	Remote Location Attributes	Y	
Remote Terminal Names	N/A	N/A	Y	
Optical Node Unit	Click	Optical Node Unit Attributes	Y	
Fiber Risers	Click	Fiber Sheath Attributes	Y	

6.2.2 Select and Query Visible Graphical and Network Facility Items

6.2.2.1 List Attributes of a Fiber Sheath

Embodiment	List the data attributes of a fiber sheath.
Description	FMT can provide the user with the ability to obtain defined information about a fiber sheath. This may be in conjunction with a fiber strand or a conduit, or as a request for information about a specific fiber sheath.
Data	See Data Embodiments: Fiber Sheath
System Behavior	The system can provide the user with the ability to select a fiber sheath in a graphical environment or on a query screen. For example, a user selects a sheath in the graphical layer, and FMT displays the fiber sheath's attributes, with an option to further define the search on the query screen environment. On the query screen, the system can provide multiple parameters for a search. For example, a user may want to view fiber sheath(s) by Manufacturer, Type, Year Placed. Based upon the scope and results of the query, the user can be able to further narrow the search. For example, a user enters Manufacturer and Year Placed as parameters, and FMT displays a listing of all sheaths meeting the criteria. The user can then select an individual sheath to review its data attributes. The user can view the sheath position (compliment) from

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	the physical strand view
Spatial Embodiment	This is viewed as a simple "Attribute Review" embodiment, whereby the user selects a fiber cable in the graphical environment to review its data attributes. This action displays the attributes of the selected fiber cable. In addition, "child" tabs or pages can be made available for review on a fiber cable's attribute review panel, e.g., a Complements page that shows the complements associated with the particular fiber cable. Additional tabs that can be considered as candidates for "child" tabs include Logical Strand and Equipment Locations. Each of these tabs can be considered for additional functionality, such as providing launch points from Spatial to FAS from some of these child attribute review tabs. However, some of these launch points can be available in other places in the application
User Action(s) in Spatial	Select a fiber sheath RMC and select 'Attribute review' to see sheath attributes
Spatial to FAS I/F	Dependent on child tab definitions: Fiber = none Complement = none Strand = LAUNCH (cable name & strand) Location = LAUNCH (CLLI, Area #, &/or loc_clli)
I/F Type	Strand = XML (1) Location = XML (1)

6.2.2.2 List Attributes of a Fiber Splice

Embodiment	List the data attributes of a fiber splice.
Description	FMT can provide the ability for a user to obtain defined information about a fiber splice. This may be in conjunction with an item of DLE equipment, fiber strand, fiber sheath, or as a request for information about a particular fiber splice.
Data	See Data Embodiments: Fiber Splice

6.2.2.3 List Attributes of a Fiber Strand

Embodiment	List the data attributes of a fiber strand. This applies to both loop and Central Office fiber cables.
Description	FMT can provide the ability for a user to obtain defined information about a fiber strand. This may be in conjunction with an item of DLE equipment, a fiber sheath, a splice, or as a request for information about a specific fiber strand.
Data	See Data Embodiments: Fiber Strand
System Behavior	The system can provide the user with the ability to select a fiber strand in a graphical environment or on a query screen. For example, the user selects a strand and FMT displays the fiber strand's attributes, with an option to further define the search on the query screen. On the query screen, the user can query the data using multiple parameters to define the search. For example, a user may want to view fiber strand(s) by Status, Mode, Beginning or Terminating Wire Center. Based upon the scope and results of the query, the user can be able to further narrow the search. For example, a user enters Beginning Wire Center and Status as parameters, and FMT displays a listing of all fibers meeting the criteria. The user can then select an individual strand to review its data attributes.
Spatial Embodiment	Definitions for reference: OPEDS Strand: Matches the OPEDS Sheath/IPID Physical Strand: What is in the field - Equipment to splice to splice to equipment Logical Strand: same as physical, except without the splices (equipment to equipment) Derived Strand: Path created by WDM EQUIPMENT.
User Action(s) in Spatial	Select a fiber sheath RMC and select 'Attribute review' to see sheath attributes Select the 'Strand' tab to see all strands on sheath Select 'Details' push button to see FAS data
Spatial to FAS I/F	LAUNCH (CLLI, Cable name & strand)
I/F Type	(1) XML
Scenario:	
User can search for a fiber strand through FAS search, using strand name, locations that are fed by the strand and equipments that are connected to that strand. Users can also select a fiber strand on the spatial tool, and be able to see the corresponding tabular data in FAS. Data elements that may be displayed on the FAS screen:	
Strand ID (cable/pair), Location(s) where the strand is terminated, Equipment associated with strand (including location, strand, slot, and SCID), LEAD status and CKID, TIRKS status and CKID, User status (probably pulldown including spare, working, restricted, defective) and CKID, Interest (LRS), Connector types, Mode (single v/s multi), comments, Loss data	

6.2.2.4 List Attributes of an Equipment Location

Embodiment	List data attributes for Equipment Locations
Description	Equipment Locations are defined as either a Central Office (CO) or a Remote Terminal (RT). For a specific Equipment Location, FMT can provide a defined set of data attributes (e.g., address, equipment housed).
Data	See Data Embodiments: Equipment Location
System Behavior	The system can provide the user with the ability to select an Equipment Location in a graphical environment or on a query screen. When the user selects an Equipment Location, FMT can provide a listing of the Equipment Location's data attributes. From here, the user can be able to view associated attributes, such as equipment located in the Equipment Location. The user selects an Equipment command button to display a query screen. The user can define the search by entering parameters (e.g., type, status). Based upon the results of the query (e.g., a Mux type was selected), the user can have the ability to further define the search by selecting the equipment item to review its specific data attributes.
Spatial Embodiment	User can select equipment location and review its attributes. User can opt to review data in FAS from the selected location.
User Action(s) in Spatial	Select equipment location feature RMC and select 'Attribute review' to see location attributes Select 'Details' to see FAS data
Spatial to FAS I/F	LAUNCH (CLLI, Area #, LOC__CLLI)
I/F Type	(1) XML
Scenario:	
User can search for equipment in FASWEB, using any one of the above defined relationship. User can also select a location (area number) in spatial number and FAS can display all the information about that location in the above defined structural order. For TIRKS equipments, the above entity relationship may not be correct. But the parent object area number/geo code can be there.	

6.2.2.5 Display Data Attributes of a Conduit

Embodiment	List the data attributes of a conduit
Description	FMT can provide the ability for a user to obtain information about a conduit run. This may be in conjunction with a fiber sheath, or as a request for information about a specific run.
Data	See Data Embodiment: Conduit
System Behavior	The system can provide the user with the ability to select a conduit in a graphical environment or on a query screen. For example, a user selects a conduit in the graphical layer, and FMT displays the conduit's attributes, with an option to further define the search on the query screen. On the query screen, the user can query the data using multiple parameters to define the search. For example, a user may want to view conduits by Type or Length. Based upon the scope and results of the query, the user can be able to further narrow the search. For example, a user enters Type as a parameter, and FMT displays a listing of all types meeting the criteria. The user can then select a Type to review all conduits of that particular type. Next, the user could select a specific conduit.
User Action(s) in Spatial	Select a route conduit feature RMC and select 'Attribute review' to see fiber sheath attributes associated with the conduit run.
Spatial to FAS I/F	See section 6.2.2.1 for details
I/F Type	See section 6.2.2.1 for details

6.2.2.6 Display Data Attributes of Landbase Features

Embodiment	List the data attributes of Landbase Features
Description	FMT can provide the ability for a user to obtain information about landbase features such as streets, parcels, lakes, rivers, etc.
Spatial Embodiment	Simple attribute review of the selected feature
User Action(s) in Spatial	Select a land base feature RMC and select 'Attribute review' to see fiber sheath attributes associated with the conduit run.

6.2.3 Provide Fiber Calculation Tools

6.2.3.1 Determine Number of Splices in a Strand

Embodiment	Determine the number of splices in a strand.
Description	May require a change to the facility database model. Facility database does not contain a SPLICE. The number of splices equals the number of sheaths that contain the strand.
Data	Strand attributes: Continuity, Splice Type, Default Loss, Measured Loss See Data Embodiments: Fiber Splice Sheath attributes: IPID # Default loss; measured loss

-continued

System Behavior	When the user selects a strand, the system can indicate the number of splices. The system can provide this function in both a text and graphical environment.

6.2.3.2 Provide Distance Between Points on a Fiber Strand

Embodiment	Provide the ability for a user to select two position points along a fiber strand, and the system can respond with a distance measurement along the fiber strand between the two points.
Description	FMT can provide the ability for a user to select any two points along a fiber strand to determine the distance between the points. The distance calculation can include loop distances along the fiber strand path.
Data	See Data Embodiments: Fiber Sheath
System Behavior	FMT can provide the user with the ability to view a fiber strand route in the graphical layer. The user can be able to select (i.e. mouse click) two points along the fiber strand path. FMT can indicate the distance.
Spatial Embodiment	Calculate sheath distance along a route between two points. Calculation is a proration of geographic distance and database lengths; where/when intelligent loops features exist (planned for Spatial Age EWO), the sheath distance can calculate based on loop location & lengths, and span lengths.

6.2.3.3 Provide Distance Between Geographic Points

Embodiment	Provide the ability for a user to perform a distance measurement between any two points within the current graphical view of the landbase and network facilities.
Description	FMT can provide the user with the ability to select any two points within the current graphical view to determine the distance between the points. For any two points within the landbase, a user can have the ability to determine distance between the points. The system can round all distance measurements to the nearest foot or meter.
Data	Systems: OPEDS
System Behavior	FMT can provide a view of a fiber strand path in the graphical environment. The user can be able to select (i.e. mouse click) a series of points within the graphical view. FMT can indicate the distance.

6.2.3.4 Calculate and Display Anticipated dB Loss of Fiber Strand Path

Embodiment	Calculate anticipated dB loss of a fiber strand path.
Description	At a user's request, FMT can calculate the anticipated dB loss of a fiber strand path. **Based on loss data associated with fiber splice (See 6.2.3.1): The attenuation property of a sheath plus the splicing loss.
Data	See Data Embodiments: Fiber Sheath - Attenuation

6.2.3.5 Input Loss and Locate Fiber Cut

Embodiment	Input Fiber Loss and locate the Fiber Cut
Description	User can input the loss of a fiber and the system can generate where the fiber cut is located.
Data	This can be based on the best data which is available. First choice is actual splice loss, second choice is default loss. User can also be shown the measured loss, but no logic can be performed against the measured.
Spatial Embodiment	User Interface (Outage Location function) for user to select fiber strand (fiber name, strand), indicate ring type, side, test location (area # or loc/clli), and enter db loss OR distance reading. Spatial calculates cut location using default loss values, and/or actual loss values if present.
User Action(s) in Spatial	
Spatial to FAS I/F	Read stored loss values for fiber strand in FAS.
I/F Type	(2)

6.2.3.6 Generate Restoration Order Based On System/User

Embodiment	Generate Restoration Order/Assigned Restoral Order
Description	FMT can generate or assign a restoration order that is based on the system or user. It can generate a fiber strand restoration priority list from a graphically selected fiber sheath within an average of 60 seconds or less from a web user interface.
Data	Need info by sheath and then by ribbon and then by strand.
Spatial Embodiment	Provide user interface to select one or more fiber sheaths.

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	Spatial then passes strand information (by sheath, ribbon, & strand) to FAS.

6.2.4 Generate Fiber Schematics

6.2.4.1 Use Automatic Schematics Tool

Embodiment	Add system generated schematics
Description	The system can generate high-level graphical view of facility routes with less detail and no landbase. These "stick" schematics should provide the user with a general view of the location, number, and size of fibers in an area, allowing for easy viewing and analysis of a large geographical area.

Data	Data Description	Source (Primary, Secondary)
General Discussion	Area of concentration is fiber since not much copper relief is being done (or authorized) anymore.	
Spatial Embodiment	Types of schematic generation desired are handled by 'view' capabilities in COTS.	

6.2.4.2 Use Manual Schematics Tool

Embodiment	Allow for user created schematics
Description	The system can allow a user to create or import existing "stick" schematics, which have no underlying landbase.

6.2.5 Integrate Fiber Related Data

6.2.5.1 Add Fiber Strand and Derived Wavelength Data

Embodiment	Allow for Fiber Strand assignment(utilization) data to be added into a source database.
Description	FMT can establish a source database for fiber strand assignment.
General Discussion	"FMT" can be the de facto data source for fiber strand data. What may be most important is not 'assignment' type data but instead 'utilization' type data. Spatial creates 'physical strands' from OPEDS fiber sheath data using complements. Spatial also creates logical strands, or assemblies, from the physical strand data. An assembly essentially runs from 'port to port', providing end-to-end connectivity of a single strand. Spatial can provide an interface to FAS for this 'logical strand', or assembly, data.
Spatial Embodiment	Build necessary physical & logical strand data from OPEDS data. Provide an interface to FAS to acquire logical strand data.

Data elements that should be displayed on the FAS screen:

Same as 6.2.2.3.

Source for all the data elements for this embodiment:

Same as 6.2.2.3.

See 6.2.2.3

6.2.5.2 Provide Connectivity Between Fiber Strand and Equipment Slot

Embodiment	Track the connectivity between a fiber strand and DLE equipment and display the data attributes for each associated item of equipment and fiber strand.
Description	For a specific strand, FMT can identify the DLE equipment in which the strand originates and terminates. FMT can also provide a defined set of information regarding each of these items of equipment. Conversely, for a specific item of DLE equipment, FMT can identify the specific strand(s) that is/are either terminating or originating. FMT can also provide a defined set of information regarding each of these fiber strands.
Data	See Data Embodiments: DLE Equipment, Multiplexer(MUX), LGX, DSX, DLC, ONU, NMLI, Repeater Shelf, Switch, Fiber Strand
System Behavior	The system can provide the user with the ability to select a strand in a graphical environment or on a query screen, and view the results in a tabular format. FMT can track this information across wire center, district, state, and other boundaries. When the user selects a strand, FMT can provide a list of all equipment (by item or type, depending upon the query) connected to the strand. When the user selects an equipment item or type, the system can provide the equipment item's defined informational attributes, or if type is selected, all items defined by the type. The user can then be able to select an equipment item and review its informational attributes. The system can provide the user with the ability to select a DLE equipment item on a query screen. A user can select an item of DLE equipment and indicate the set of information desired. This may include a listing of all fiber strands terminating to or

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	originating from the item of equipment and/or the equipment's informational attributes. Further
Spatial Embodiment	May only need to be able to get to an equipment location and see equipment details in FAS. Drill down from fiber sheath to strand to equipment location, then launch FAS.
User Action(s) in Spatial	
Spatial to FAS I/F	LAUNCH (CLLI, area #, LOC__CLLI)
I/F Type	(1) XML
Scope for FAS:	

FAS should store the connectivity information between logical fiber strand and equipments (LEIM, TIRKS and FOX). At a high level. FAS should be able to answer the following question.
1. For any given logical fiber strand, list all the equipments connected to it.
2. For any given equipment, list all the logical fiber strand connected to it.
3. For any given logical fiber strand, list all the locations connected to it.
4. For any given location, list all the logical fiber strand connected to it.
A logical fiber strand is a fiber strand between two locations (area number). A location (area number) can have multiple CSA/location clli. A CSA can have multiple loc-ids. A loc-id can have multiple equipments.
Scenario:

User can search for an equipment in FASWEB, using any one of the above defined relationship.
User can also select a location (area number) or logical fiber strand in spatial and FAS can display all the information about that location or the fiber strand in the above defined structural order.
User can select strand and see all equipment, sheaths, and locations associated with the strand. Conversely the user can select a piece of equipment and see all strands and other pieces of equipment with which it is connected.

User can select strand and see all equipment, sheaths, and locations associated with the strand. Conversely the user can select a piece of equipment and see all strands and other pieces of equipment with which it is connected.

6.2.5.3 Provide SCID Relationships to Fiber Strand and Equipment Slot

Embodiment	Provide SCID Relationships to Fiber Strand and Equipment Slot.
Description	System should be able to form a SCID relationship between a Fiber Strand and an Equipment Slot in order to identify it.
Data	FAS tool can collect info from TIRKS as to relationship between SCID and strand(s) and equipment. AI: where is data in TIRKS.
Spatial Embodiment	FAS provides Spatial with minimum LOC__CLLI, cable id & strand in order to kick off a fiber trace of the strand and equipment of interest.

FAS should capture the relationship between fiber strand and equipment in the form of a SCID (Sonic circuit ID) relationship.

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User searches for a piece of equipment; FAS displays selected information, including SCID; user can then see all other equipment which is also associated with the SCID.
User selects fiber strand in Spatial and requests a SCID trace; Spatial performs appropriate query against FAS and the highlights SCID path and associated locations.

6.2.5.4 Provide LEAD and TIRKS Circuit IDs

Embodiment	Provide CKIDs from LEAD and TIRKS
Description	System can generate CKIDs from LFACS or LFACS and TIRKS by integrating fiber assignment data.

User searches for fiber strand; FAS displays assignment data based on data from these systems. See section 6.2.2.3
Data elements that should be displayed on the FAS screen:

See 6.2.2.3
Source for all the data elements which are required for this embodiment:

See 6.2.2.3

6.2.5.5 Capture Fiber Diversity Information

Embodiment	Capture Fiber Diversity Information
Description	Once a user has determined that a strand is diversely routed or a site is diversely fed, FMT can capture the diversity information about the Fiber and capture it into the database. The user can select a type of diversity from a list of diversity types such as sheath, route, CO.
Data	System: OPEDS Spatial embodiment: user can update FAS database with diversity information. If the user determines that something is diverse using Spatial, then Spatial can update FAS with that data.

A SINGLE FIBER STAND IS NOT DIVERSELY ROUTED, BUT A STRAND CAN BE DIVERSELY ROUTED COMPARED TO ANOTHER STRAND. EQUIPMENT CAN BE FED DIVERSELY, THUS DIVERSITY DATA SHOULD BE STORED FOR A PIECE OF EQUIPMENT
Scenario:

User determines that a piece of equipment is of a particular diversity type; user navigates to appropriate FAS webpage and enters diversity type (by selecting from a list of values)

6.2.5.6 Capture Fiber Connections from FOX

Embodiment	Capture Fiber Connections from FOX
Description	FMT can integrate with FOX to obtain where the Fibers connect. User can request FOX data for presentation. User can then be able to compare FOX data against FAS data by matching on location and bay/panel/jack. No other logic may be utilized.

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Description	FMT can integrate with FOX to obtain where the Fibers connect.

Scope for FAS:

FAS can collect the information about the connectivity between logical fiber strand and equipment from the FOX system.

Scenario:

(User can search for a logical fiber strand and see all the connected devices based on the data obtained from FOX.
User can also search for a device and see all the equipments attached to a logical fiber strand.
User can also select a fiber strand in spatial and see all the equipments attached to it based on the data we got from FOX.)
User requests FOX data. FAS presents FOX data for a location next to appropriate FAS equipment data for that location.
User then enters appropriate data in the User section of Fiber Strand data.

6.2.5.7 Capture a LOC/CLLI and Address from LOC/CLLI System

Embodiment	Capture a LOC/CLLI and Address from LOC/CLLI System
Description	FMT can capture, as needed, all LOC/CLLI and Addresses from the LOC/CLLI System.
Data	System Embodiments: LOC/CLLI

6.2.5.8 Capture Easement/ROW Information for Locations from BETS

Embodiment	Capture and Retrieve ROW/Easement data from BETS
Description	User can enter the ROW# into the planning layer of FMT and the appropriate data from BETS is retrieved.

6.2.5.9 Generate Land Base for Non-OPEDS Converted Wire Centers

Embodiment	Generate land base for non-OPEDS converted wire centers with the location of central offices, equipment sites and x-boxes from the existing OPEDS land base data.

6.2.5.10 Develop Mechanized Processes from Legacy System Sources

Embodiment	Develop a mechanized process to load data and manage conflicts from separate legacy system sources and user input from local records.
Description	The system can determine an appropriate source to use to provide existing fiber and equipment attributes. Conflict identification of database and source documents should be easily documented and feedback to the keepers of the source documents should be made as ease as possible.
Data	See section 7 Also capability to upload fiber strand attributes into FAS.

Scope for FAS:

From a user's perspective this embodiment can be the same as 6.2.2.3 with the addition that the user can also have a means of bulk loading data into FAS based on data which does not exist in the other source databases.

Scenario:

See 6.2.2.3

Data elements that should be displayed on the FAS screen:

See 6.2.2.3

Source for all the data elements which are required for this embodiment:

See 6.2.2.3

6.2.5.11 Manage Out of Franchise Fiber and Equipment

Embodiment	Develop a means of managing out of franchise fiber and equipment
Description	The telecommunications company may own fiber optic cables and equipment in areas outside of the 1600 wire centers. This fiber needs to be shown graphically, and the fibers can be tracked in the tabular tools.
Data	The data elements are identical to data for fiber and equipment in franchise.

This information may first be entered in the source databases (EWO and LEIM, etc.)

6.2.5.12 Display and Identify CLEC Sheaths and Equipment

Embodiment	Display CLEC sheaths, strands, and equipment in the graphical and tabular tools
Description	Competitors may have the right to utilize structures (pole lines, ducts, manholes, cabinets, etc.) Wherever these facilities are identified and entered into a source system by engineering, those facilities must be properly identified in FMT. Facilities which are identified in OPEDS as belonging to other companies may be identified as such in FMT. Equipment which is identified in LEIM and/or TIRKS must be identified as such. The LEIM equipID can carry the intelligence as to which equipment belongs to CLECS, but the standard has not yet been set; as a result, a means of parsing EquipID's and comparing them against a ruleset for determining ownership must be created.

6.2.5.13 Allow Entry of Fiber Loss Data

6.2.5.13.1 Allow Manual Entry of Fiber Loss Data

Embodiment	Allow user to enter actual measured loss for a fiber strand
Description	If a user has measured the loss for a fiber strand, that user should be able to enter that loss information for that strand.

6.2.5.13.2 Allow Automatic Entry of Fiber Loss Data

Embodiment	Allow user to upload measured loss data for a fiber strand
Description	If a user has measured loss data stored electronically, the system can upload that data and store it.

6.2.5.14 Display Measured Loss

Embodiment	Display Measured Loss
Description	User can view the measured loss via a webpage or spatial

6.2.6 Provide Fibers and Related Equipment Search and Display

6.2.6.1 Display Cabinets for Specified Equipment Location

Embodiment	Display Structures for Specified for Specified Equipment Location.
Description	System should be able to display appropriate structures that relate to the specified equipment location that is specified by the user.

6.2.6.2 Display Devices for Selected Structure—Filter by Type

Embodiment	Display Devices for Selected Structure and Filter by Type
Description	User can select a structure and the system can display the devices by type.

6.2.6.3 Display Selected Device Attributes

Embodiment	Display Selected Device Attributes
Description	User can select a device from the screen or either by navigation or via a search, and the system can display the attributes for that device.
Data	Data Embodiments: All devices

User can search for equipment by using different FAS search functionalities. Once equipment is selected, FAS can display all the attributes of the equipment.

6.2.6.4 Display Device Slots and Related Circuits

Embodiment	Display Device Slots and Related Circuits
Description	User can select a device, circuit, or fiber from the screen or search for one, and the system can display the appropriate device slots and related circuits.

Scope for FAS:

Display the slot and circuit information for a given device.
All equipment from LEIM and TIRKS can be loaded into FAS; same attributes as shown today in FAS can be displayed

Scenario:

User can select the equipment through FAS search or through selecting a location from Spatial.

6.2.6.5 Locate Equipment by Address

Embodiment	Locate equipment by address
Description	User can enter an address and the system can display the equipment associated with that address.
Spatial Embodiment	Multiple embodiments 1) configure a Equipment Location locate - search by address, area #, loc_clli 2) configure a street address locate 3) launch FAS from equipment location 4) provide Launch & Locate capability from FAS for street address

Scope for FAS:

FAS should allow the user to search for a location using the address.
User can search against address, CLLL, or AreaNumber/GLC. Address includes all possible address attributes, including House Number, street, floor/suite

Scenario:

Provide a search for searching a location by address.
Data elements that should be displayed on the FAS screen:

Display all attributes of a location (CSA/locid)

6.2.7 Provide Fibers and Equipment Utilization Monitoring

6.2.7.1 Provide CSA Utilization by Service Type

Embodiment	Provide CSA Utilization by Service Type
Description	CSA fill data can be created in a similar fashion as the Crossbox Report, which is currently under development in FAS. Users can determine which systems are fully utilized and which systems are underutilized.
Data	Built on existing interface between FAS and LEAD.

6.2.7.2 Provide CSA Alerts to FACILITY PLANNERSs

Embodiment	Provide FACILITY PLANNERSs with some sort of an alert of a CSA

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Description	Users can receive an alert of CSA when they are logged in to FMT and via email.

Data	Data Description	Source (Primary, Secondary)

6.2.7.3 Determine Fiber Strand Utilization

6.2.7.3.1 Determine Whether Physical Strand is Assigned

Embodiment	Determine whether physical fiber strands are assigned, spare, or defective.
Description	The system can store information which indicates whether a physical fiber strand is in use or can be used to provide service.
Data	Assigned indicates that a fiber is either working or reserved. Assigned in analogous to saying that a fiber is "lit". Spare indicates that no traffic is transmitted on the fiber strand. Defective indicates that the fiber strand is currently incapable of transmitting data. See Data Embodiments: Fiber Strand

Scope for FAS:

General Utilization = Lit fibers/total fibers
And
Weighted Utilization = Sum of (Lit Fibers × FKF(lit))/sum of (total Fibers × FKF (total Fibers))

6.2.7.3.2 Determine Physical and Derived Fiber Strand Utilization

Embodiment	Determine which physical and derived fiber strands are in use
Description	The system can store information which indicates if a fiber strand is connected to Wave Division Multiplexing equipment (WDM or DWDM) which allows data to be transmitted on several distinct wavelengths (lambdas). The system can also store information as to which lambdas are assigned, spare, or defective.
Data	Assigned indicates that a physical or virtual fiber strand is either currently transmitting data or reserved. Spare ad Defective are defined in 6.2.7.3.1. See Data Embodiments: Fiber Strand

Scope for FAS:

Utilization Formula - # of Lit Derived and Physical Fibers/(total number of Derived and Physical fibers)
Data elements that should be displayed on the FAS screen:

Report can include:
Total number of fibers; number lit; number spare; number defective; number with interest; number otherwise unavailable

6.2.7.3.3 Determine Carrier Signal Level Utilization for a Strand

Embodiment	Determine Carrier Signal Level Utilization for a Strand
Description	The system can store information which indicates if a fiber strand is connected to Wave Division Multiplexing equipment (WDM or DWDM) which allows data to be transmitted on several distinct wavelengths (lambdas). The system can also store information as to which lambdas are assigned, spare, or defective.
Data	Assigned indicates that a physical or virtual fiber strand is either currently transmitting data or reserved. Spare ad Defective are defined in 6.2.7.3.1. See Data Embodiments: Fiber Strand

Provide matrix report similar to Xbox and/or CSA report. Rows consist of fiber by mode, physical, and derived fiber strands. Columns consist of services such as NMLI, customer OCn ring, Company OCn ring, dry fiber, etc. User can select points in Spatial and designate them as monitoring points; this report can be run at any location and at a monitoring point.

6.2.7.3.4 Determine DS0 Equivalent Utilization for Virtual and Physical Fiber Strands

Embodiment	Determine DS0 Equivalent Utilization
Description	The system can store information which translates the circuits which are working on a fiber strand to the equivalent number of DS0's based on conversion values.
Data	Assigned indicates that a physical or virtual fiber strand is either currently transmitting data or reserved. Spare ad Defective are defined in 6.2.7.3.1. See Data Embodiments: Fiber Strand

Embodiments may use DS3 equivalent rather than DS0 equivalent. Based on categorizations in previous embodiment and a conversion table, the number of DS3 equivalents for a strand can be determined.

6.2.7.4 Determine Fiber Sheath Utilization

Embodiment	Determine Utilization of each Fiber Sheath
Description	User can select a fiber sheath to see the utilization.
Data	See Data Embodiments: Fiber Sheath
General Discussion	Net result - utilization calculations are done using data stored in or available to FAS.
Spatial Embodiment	User may select a fiber strand(s) (via fiber sheath) on which to perform utilization. Spatial passes logical fiber information (cable id, strand) to FAS to perform utilization function.

6.2.7.5 Determine Utilization Trend Analysis

Embodiment	Determine Utilization Trend Analysis
Description	User can view the current or past trends of utilization among a given search parameter, i.e. district, state, etc.
Scope for FAS:	
For a location and a monitoring point. FAS can keep high level utilization data for trend analysis.	

6.2.7.6 Determine Fiber Cross-Section Alerts

Embodiment	Determine Fiber Cross-Section Alerts
Description	User can receive an alert or warning for specified fills on strand and bandwidth utilization once they have reached the specified number that is set as the default or warning level. These alerts can be based on fiber sheath and on cross section (route, a combination of fiber sheaths in the same geographic area). Ex. "Send me an email notice when this cross section has only 6 spare fibers remaining." Note: Spare should not include defects.
Data	Default values and warning level can be set for specified fills; and users can receive these warnings once the data has reached or past that level.
Spatial Embodiment	Provide a feature, "Monitor Point", that is placed by the user. This feature identifies one or more fiber sheaths to be monitored. User may define sheaths for inclusion (association with) in the feature by selecting sheaths or by drawing a polygon around desired sheaths. User may optionally define which specific strands of this group they wish to monitor. User also defines the maximum fill (or minimum spare) threshold to issue an alert. Frequency of monitoring is specified by (user specified or default frequency) A) Spatial passes this information (monitor id, CLLI, & list of cable id and strand, min/max, etc.) to FAS for monitoring. Spatial provides a "Cross Section Alert" theme (view) customized to show only those features of interest to a user who wishes to see status of these features. The Monitor Point feature is set to display in one color if monitor level is safe and a different color if the monitor level is in danger. There is no 'automatic notification' of alerts in Spatial; it is up to the user to invoke this theme whenever the user desires to do so. B) When this "Cross Section Alert" theme is invoked, Spatial queries a view/table provided by FAS to set the required displays for the Monitor Point feature. User can select the monitor feature and launch FAS to see details for the selected cross section.
Spatial to FAS I/F	A) NOTIFY (monitor id, CLLI, list of cable id/strand, min/max) B) QUERY Table (monitor id, group status) C) LAUNCH (CLLI, list of cable id/strand)
I/F Type	A) (1) XML (new action = NOTIFY) B) (2) View/table (required)

Embodiments can use the spatial age, to define the monitoring fiber cross-section group. Spatial age can find the fiber strands, which are inside this user-defined group, and can send the FAS strand data to FAS. FAS can start monitoring that group based on the fiber utilization logic

FAS also can create a mechanism to provide this information to Spatial age.

FAS may not have the capability to create a monitoring spatial group. It may always be done from Spatial.

But FAS may have the capability to define what is Red, Yellow and Green.

As part of reports, spatial engine can send a list of elements to FAS for which we need the alert information. That can enable Spatial to display the data in a color coded form.

For example, spatial can send list of fiber strand and FAS can send the color-coded information for those FAS strand. Based on that Spatial can display a graphical view of the report.

Scenario:

User can define a cross section in the spatial tool. Once a cross section is defined, spatial tool can provide FAS with the entire fiber strand information, which is part of that cross section.

Based on the fiber strand utilization the corresponding cross section can be color-coded. FAS can also provide alerts on the main page based on the cross section status.

Data elements that should be displayed on the FAS screen:

For a tabular view of a cross section, what data elements may be displayed in FASWEB module.

Monitoring Point (cross section) can be shown along with its various forms of utilization as defined in sections 6.2.7.3

Monitoring Points should include Locations, and user can suppress alerts similar to MG alert suppression for Xbox in FAS today.

Source for all the data elements which are required for this embodiment:

See section 6.2.7.3 for different types of utilization. Alerts can be based on % utilization based on physical strand.

For a Location, FAS may have knowledge of strands which are associated with it based on 1)OPEDS sheaths which feed an electronics location and 2) Spatial selection of one or more sheaths in the same general geographic area. There is a natural relationship between sheath and logical strand.

6.2.7.7 Determine MUX Utilization

Embodiment	Determine MUX Utilization
Description	User can determine MUX utilization to determine fiber utilization This is "iView" mux utilization which is based on a worst case combination of LEIM, LEAD, TIRKS, and User DS1 and above data. User can pull reports based on this utilization as well as see this data in the existing FAS view of equipment.

6.2.7.8 Monitoring Point

Embodiment	Monitoring Point
Description	Spatial may need to allow user to place a monitoring Point to see and define strands to be monitored for utilization at a particular route cross-section. Locations are, by default, Monitoring Points. The user can define additional Monitoring Points and assign those points a name and some comments.

6.2.7.9 Xbox and CSA History and Trending

Embodiment	Xbox and CSA History and Trending reports
Description	Maintain high level Xbox and CSA utilization data for up to 5 years
Data	Based on the original concept for the Xbox reports, monthly data for Xbox and CSA can be maintained for 24 months; quarterly data can be maintained for an additional 3 years. This data is essentially the summary row for each of the services for the Xbox or CSA. Based on past utilization, generate trendline so that user can estimate future needs.

6.2.8 Provide Fiber Tools and Reports

6.2.8.1 Generate Equipment Site Activity Log

Embodiment	Create a Site Maintenance Package
Description	A site maintenance package consists of easement information for a site (location clli) and the structures, which exist there. The user also needs to be able enter comments along the lines of where to park, restrictions, etc.
Data	Easement, any comments/restrictions, all TEO and/or jobs Filed by CSA Need additional jobs besides those which are stored in LEIM (site prep job, etc.)
Spatial Embodiment	MOSTLY FAS, but not necessarily all. User can Launch FAS to see Location.

Scope for FAS:

Site maintenance package is maintenance package information for a CSA. All the data may be manually updated/entered by users. FAS MAY MAINTAIN A LIST OF LRS'S WHICH ARE ASSOCIATED WITH A LOCATION. HIGH LEVEL DATA FROM THE LRS, INCLUDING EWO NUMBER, SCOPE OR WORK, JOB CLOSED DATE CAN BE STORED. THIS DATA MAY BE AUTOMATIC, ASSUMING THAT USER PROPERLY ENTERS ATTRIBUTES IN LRS. USER MAY ALLOW ENTER COMMENTS FOR THE LOCATION. USERS CAN ALSO ENTER ADDITIONAL HISTORICAL DATA ALONG THE SAME LINES AS THAT WHICH CAN BE AUTOMATICALLY GENERATED USING THE LRS.

Scenario:

User can select a CSA either through search or through spatial. Once a CSA is selected, then user can enter certain information as maintenance log, such as notes, which can be captured with updated date and user name.

6.2.8.2 Allow User to Determine Fiber Strand Diversity

Embodiment	Determine Diversity of a Fiber Strand
Description	A strand is route-diverse when it is not in or on the same supporting structure (conduit). A strand is CO-diverse when it is route-diverse and terminates in two Central Offices. Users can determine whether a fiber strand is non-diverse, CO-diverse or route-diverse with tabular and graphical data.
Data	Systems: OPEDS There may be a desire to know the relationship of one system assembly to another and the diversity of one system assembly to another.
Spatial Embodiment	1) Spatial provides a 'diversity check' trace function to allow user to determine 'sheath level' diversity. The diversity check provides a visual (via highlights) indicator as well as trace results dialogs showing 'common' paths in the trace. 2) A diversity check can also be launched from FAS. FAS provides a set (pair) of logical fibers (cable name(s), strand(s)), each terminating loc/clli (or area #), and LGX port data (this may need to be accessed via connector type 2).

Scope for FAS:

Spatial can provide a list of strand and FAS can provide the list of associated equipment, shelf and slot for that strand. FAS can allow the user to launch spatial for given equipment. FAS can send the list of strands based on the scid, which allow spatial to display the ring.

Based on 6.2.5.5 user can enter diversity information for a piece of equipment.

Scenario:

User selects location in Spatial. User navigates to FAS and looks up fiber information for equipment at that location. In Spatial user then runs a diversity check for the fiber strand(s). Once user determines diversity type user enters that type in the FAS equipment screen. Diversity type is from LOV or "other" which allows the user to manually enter some other value.

Data elements that should be displayed on the FAS screen:

Equipment (from FAS equipment database), feeding fiber strand(s), and diversity type

Source for all the data elements which are required for this embodiment:

FAS equipment database (LEIM and TIRKS), Spatial Age, User

6.2.8.3 Assign Restoration Priority for a System Assembly

Embodiment	Assign a restoration priority for a System Assembly.
Description	System can assign a priority based on a maintained list of values. This priority number

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	can be used when the restoration order is generated in the event of an emergency restoration (see 6.2.3.6 Generate Restoration Order Based On System/User)

6.2.8.4 Assign Reservation for a Fiber Strand

Embodiment	Assign Reservation for a Fiber Strand
Description	User can reserve fiber for a LRS. The word Reserve is now replaced with the concept of "Interest." An interest in a strand is established via a LRS.

User can establish an "interest" in a fiber strand via a LRS. An interest indicates that the strand may be used in the future if the LRS is executed, but there is not guarantee that the strand can be used, thus it is not reserved. Interests are only created from within FAS, not from LEIM, TIRKS, or any other system.
Data elements that should be displayed on the FAS screen:

See LRS and 6.2.2.3

6.2.8.5 Provide Numbering Administration Tools

6.2.8.5.1 Add System Numbering Tool

Embodiment	Add an automated DLC/mux numbering tool
Description	The system can provide a means to administer DLC system and mux numbers. FAS can stored existing system numbers and planned system numbers by equipment type. FMT can not attempt to predict next usable number.

Scope for FAS:

Four alpha numeric characters after the # symbol is the system number. FAS should develop a system number maintenance module. System number may be unique for a given WC. FAS should provide mechanism to propose new system number and display existing system numbers.
Numbering scheme is determined by equipment type; system helps user understand which numbers within a scheme are in use and which ones are available
Scenario:

During the LRS lifecycle the user determines that a new system must be created. User enters appropriate equipment data (including category) in the LRS and then wants to know what the system number should be, so he clicks a "find system number" link.
Data elements that should be displayed on the FAS screen:

Equipment type, used system number(s), next available system number
Source for all the data elements which are required for this embodiment:

LEIM

6.2.8.5.2 Add SCID Administration Tool

Embodiment	Add a tool for managing SCID assignments
Description	The system can provide a means of administering SCID's for districts and throughout the company.

For a given state. FAS can store all the valid SCIDs and also can be able to find the next SCID. FAS can provide a mechanism to assign a SCID based on the FACILITY PLANNERS request.
Rule for SCID's may be as follows:
6 characters, N1–N6.
N1 indicates company division,
typically N for network
N2 indicates state
N3–N5 is alphanumeric
N6 designates ring type (L, G, R, P for Loop, Smartring . . .)
Source for all the data elements which are required for this embodiment:

Existing SCIDs from TIRKS and LEIM

SCID Log Tool—General

FMT can provide users the ability to view SCID assignments, select a new SCID assignment, and to unassign a SCID that has not been or no longer used. FMT can also provide Staff Support persons the ability to establish rules for SCID assignments. SCID can have a Status transition as follows:

SCID Status Codes:

CODE	DESCRIPTION
N	New, never assigned or used - available for assignment
H	Hold, do not assign
A	Assigned
W	Working/Used
X	Deleted - not found working
U	Unassigned

SCID Status Transition:

FROM STATUS	TO STATUS	ACTION	DESCRIPTION
<null>	N	ADD SCID	Process that adds SCIDs to log to make available for use.
<null> or N	H	HOLD SCID	Manual DBA addition of SCIDs to Log or status change.
<null>, N, U, or X	A	ASGN SCID	Assigned for use. SCID added or updated in SCID_LOG. If SCID had a status of U or X, the log data is stored in SCID_History before update.
any	W	UPDATE SCID LOG	Batch process run periodically to determine if SCID is still in FMT data. SCID is found in FMT (LEIM or TIRKS) data. SCID added or updated in SCID_LOG.
A	U	UNASGN SCID	User that initially assigned SCID determines that it is not required and Unassigns it. SCID Status is changed from 'A' to 'U' and status date updated.
W	X	UPDATE SCID LOG	Batch process run periodically to determine if SCID is still in FMT data. SCID is not found in FMT (LEIM or TIRKS) data.

SCID Log Tool—ASGN SCID

Embodiment	Provide New SCID Assignment
Description	User can select ASSIGN SCID function that can allow input parameters to be selected or changed and the next available

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	SCID to be assigned. The next SCID assignment that meets the parameters can be assigned the lowest unassigned SCID.
Data	The data to be selected by the user to determine next SCID assignment is a follows: 1) State 2) District 3) SCID Type The data to be possibly captured for the SCID assigned is: 1) User 2) Date 3) LEG Installation ID 4) Equipment 5) Authorization Number 6) Address 7) Service Date
ASGN SCID Screen	Upon selecting the ASGN SCID function, the user may be presented with an ASGN SCID screen. Item are as follows: 1) State - drop-down of 9 BST States defaulted to user's State 2) District - drop-down of current BST Districts for the selected State defaulted to user's District 3) Type - drop-down of valid SCID type codes & descriptions from LOV_SCID_TYPE table Upon selection of the above, the system can select the next available SCID for assignment (see SCID assignment) and present the SCID to the user. The user can then optionally enter: 1) LEG Installation ID 2) Equipment 3) Authorization Number 4) Address 5) Service Date Upon selecting an "ASGN SCID" button, the SCID can be assigned. Upon assignment the ASGN SCID button can change to UPDATE SCID. The user may update any of the 5 optional items and hit the UPDATE SCID button to save the changes. (Note: Once assigned, the State, District, Type codes may not be changed.)

SCID Assignment:

FMT can create a new SCID by:

Select from SCID_Log any SCID with a first character, second, third and last characters matching user selection and SCID assignment rules:

1) status of New. If found, use this SCID. If none found then,
2) status of Unassigned and a Status Date where 'today' minus Status Date in days is greater than LOV_FMT_PARAMS: SCID_Unasgn_Age. If found, use this SCID. If none found then,
3) status of Deleted and a Status Date where 'today' minus Status Date in days is greater than LOV_FMT_PARAMS: SCID_Deleted_Age. If found, use this SCID. If none found then,
4) assign a new SCID:

A new SCID is formed by concatenating SCID_First_Char+SCID_Second_Char+SCID_Third_Char+(SCID_ASGN: SCID_Num+1)+SCID_Last_Char

Using SCID assignment rules (see logical data model embodiments).

The FMT system may assign a new SCID "on the fly" or develop a batch process to add new SCID to the log on a periodic basis (ADD SCID function).

SCID Log Tool—VIEW SCID LOG

Embodiment	Display SCID Data From Log Based On User Specified Attributes
Description	User can select for display the SCID log data by using various filters. State; District; Equipment; Status.
Data	See Logical Data Model Embodiments for SCID_LOG.

SCID Log Tool—UNASGN SCID

Embodiment	Change The Status On A SCID From Assigned To Unassigned
Description	User can input a SCID or select a SCID from a generated list of SCIDs with Status = Assigned created by the current user. Data for the SCID is displayed on the screen and a UNASGN Button allows the user to Unassign. System changes Status to 'U' for unassigned and records the date. The Unassign function can only be performed by the user that Assigned the SCID.
Data	N/A

SCID Log Tool—UPDATE SCID LOG

Embodiment	A Process To Update SCIDs in the SCID Log
Description	This process can periodically update the SCID status in the SCID Log. This may require a comparison of SCIDs actually in FMT and the Log. For SCID in the Log with a Status of Working that are not found in FMT, the status is updated to Deleted. For SCIDs that are found in FMT, then status is updated to Working.
Data	SCID_Log Status

6.2.8.6 Enhance Existing Database, Posting & Viewing Tools

Embodiment	Enhance the existing OPEDS Facility Management database, posting & viewing tools
Description	The system can support additional fiber functionality: Inter-wire center connector, fiber splice feature, graphical location of fiber in Underground records, and CSA/Equipment Location features.

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Spatial Embodiment	Place holder: List of OPEDS facility features to load to FMT: COMPL: complements for all loaded features CONDUIT: all 4c & 45c DRAWING INDICATORS: all FOREIGN POLE: (intelligent only) TBD FIBER: all MANHOLE: all 4c & 45c ** Equipment Location**: create for each unique area # in MX MX: see above for reference POLE: all TERM (distribution terminal table): If fed by fiber cable XCONN: any with an OUT count ROUTE MANHOLE: all ROUTE CONDUIT: all FIBER SPLICE: all XWC SPLICE: all

6.2.8.7 Develop Tools to Populate the Facility Data Enhancements

Embodiment	Develop tools to populate the facility data enhancements
Description	Develop tools to automatically populate the facility data enhancements and to provide manual effort to populate remaining data that cannot be accomplished mechanically

6.2.8.8 Develop Tools to Add Existing Fiber and CSA Locations

Embodiment	DEVELOP TOOLS TO ADD EXISTING FIBER AND CSA LOCATIONS AUTOMATICALLY/ MANUALLY
Description	Develop tools to add existing fiber and CSA locations, along with key structure and connectivity features/attributes to the FMT SDO Database, both automatically from OPEDS converted wire centers, and manually for non-OPEDS converted wire centers.
Spatial Embodiment	Provide capability to place 'planned existing <feature>' whenever necessary in addition to creating from OPEDS data via SDL. SDL creates Equipment Locations from MX data (see note above in 6.2.8.6)

If no western state fiber conversion is going to take place, additional scripts can be required to allow users to import ArcView files.

6.2.8.9 Allow User to Perform Fiber Traces

Embodiment	Allow user to perform fiber traces
Description	The user should be able to perform a trace to a fiber by entering a given attribute or criteria for the fiber.
Spatial Embodiment	Multiple trace functions are available to user via selection from physical sheath or user input. Route trace, highlight route, diversity check, fiber cut location, etc.

6.3 Planning Layer Functionality

6.3.1 LRS Overview

Planning may occur in many fashions and by many names. In order to avoid confusion, this document may use some new terms to describe the planning process.

The basic planning unit is the Location Relief Strategy (LRS). When creating a LRS, the resource planning system may automatically create or allow the user to select an existing planning Need. Multiple Alternative LRSs may be created for one Need. While many alternative relief strategies may or may not exist, according to some embodiments of the present invention, only of the LRSs is defined as a primary LRS for a need, with one or more of the other LRSs defined as alternate LRSs for the need. A LRS may be related to one or more Point Of Interest (POI). LRSs may be grouped into a View. FIG. **9** demonstrates the relationship between these concepts.

A POI is a particular location where a need exists or is predicted. POI is a geographic location, which may be a point, a polygon, or a group of noncontiguous points and/or polygons. For example, an existing building needs additional fiber capacity or a customer purchases a service, which requires diversification.

A LRS describes a means of fulfilling a need at one or more particular POIs at a given time. For example, a LRS may call for placing 2000 ft of 48-strand fiber or for the rearranging of existing fiber splices. Whenever an alternative LRS exists, one of the LRS's can be designated as Primary. By default, when a search is executed, only those LRS's, which are designated as Primary, are to be considered for the search.

A View is a collection of Primary LRS's (by default, but a View may be a collection of Primary or Alternative LRS's with an override). Examples of Views could include a three year construction plan View, a route View, a wire center View, etc. Headquarters staff can have the ability to create default View definitions, but individual users can also have the ability to create View definitions.

FIG. **10** describes in detail the functions of LRS within FMT.

6.3.1.1 LRS States

State	Definition
PRIVATE	A LRS is initially created in the Private state. Only the creator or a super-user can see it and modify a LRS in this state.
PUBLISH	In this state, all users can see the LRS in a Tabular list and in Spatial views. Any user with update permission can view, select, and modify it. Any user without update permission can view the LRS and add a LRS Note, but can not modify the LRS. Any LRS (primary or alternate) can be published from the Private state. Un-Publish a LRS and change a Publish LRS back to Private state.
DELETE	Any user with update permission may delete a LRS from the Publish state. A LRS in this state does not appear in

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State	Definition
	normal Tabular list or Spatial views. Any user with update permission may select a view of Deleted LRS from the previous Publish state and may select and clone or Undelete a Deleted LRS (back to Publish state). Only the LRS creator or a super-user can view Deleted LRS from the previous Private state and may select and clone or Undelete a Deleted LRS (back to Private state). An Alternate LRS with the Primary LRS in Design state can not be Undeleted. A LRS can not be modified in the Delete state.
DESIGN	When a user elects to hand-off the LRS to PMTool, the LRS State changes to Design upon successful hand-off. Only a Primary LRS may be handed-off. All users can see the Design state LRS in Tabular list and Spatial views. Any user with update permission can view, select, and modify it. Modification can trigger a PM Tool update. Any user without update permission can view the LRS and add a LRS Note, but can not modify the LRS. Once a LRS is in the Design state, it can no longer be deleted, but it may be canceled.
CANCEL	Only a LRS in Design state may be canceled. Any user with update permission may cancel a LRS. A LRS in this state does not appear in normal Tabular list or Spatial views. Any user with update permission may select a view of Canceled LRS and may select and Restore a Canceled LRS back to the Design state. A LRS can not be modified in the Cancel state.
COMPLETE	When the authorization associated with the PMTool task is completed, FMT can complete the LRS. In the Complete state all users can see the LRS in a Tabular list and in Spatial views. The LRS may no longer be modified. A user with update permission may select the LRS for cloning. Any user may add a LRS Note.
ARCHIVE	The FMT system can automatically archive a LRS 'x' days after the LRS is completed. This value can be set in a FMT Parameters table. A user with update permission may manually archive the LRS. In the Archive state, the amount of information associated with the LRS is reduced and can not be undone. The LRS may no longer be modified. A user with update permission may select, via a View Archive function, the LRS for view and cloning. LRS Notes can no longer be added.
<null>	The FMT system can automatically purge a LRS 'x' days after the LRS is archived or deleted. The number of days can be set in a FMT Parameters table, and can be different entries for Archive Purge and Deleted Purge. Any user with update permission may select a view of Deleted LRS from previous state of Publish and may select and Purge a Deleted LRS. Only the creator or super-user may select a view of Deleted LRS from previous state of Private and Purge a selected LRS.

6.3.1.2 Primary LRS State Transitions

From State	To State	Action	Notes
<null>	Private	User: LRS Create	The LRS Create function creates a LRS in the Private state.
Private	Publish	User: LRS Publish	The LRS Publish function can change a LRS to the Publish state.
Publish	Private	User: LRS Un-Publish	The LRS Un-Publish function can change an LRS to the Private state from the Publish state.
Private or Publish	Delete	User: LRS Delete	The LRS Delete function can change an LRS to the Delete state from the Private or Publish states.
Delete	Private or Publish	User: LRS Undelete	The LRS Undelete function can change an LRS to its previous state (Private or Publish) from the Delete state. An Alternate LRS with the Primary LRS in Design state can not be Undeleted.
Delete	<null>	System: LRS Purge User: LRS Purge Deleted	The system LRS Purge function or user LRS Purge Deleted function can completely remove a LRS in the Delete state from the FMT system.
Publish	Design	User: LRS Hand-off	The LRS Hand-off function can change an LRS to the Design state from the Publish state if successfully handed-off to PM Tool.
Design	Cancel	User: LRS Cancel	The LRS Cancel function can change an LRS to the Cancel state from the Design state.
Cancel	Design	User: LRS Restore	The LRS Restore function can change an LRS to the Design state from the Cancel state.
Cancel	Archive	System: LRS Archive User: LRS Archive	The LRS Archive function can change an LRS to the Archive state from the Cancel state. This function can be automatically initiated by the FMT system or may be user initiated.
Design	Complete	System: LRS Complete	The system LRS Complete function can change an LRS to the Complete state from the Design state when the authorization is shown as closed in PMTool.
Complete	Archive	System: LRS Archive User: LRS Archive	The LRS Archive function can change an LRS to the Archive state from the Complete state. This function can be automatically initiated by the FMT system or may be user initiated.
Archive	<null>	System: LRS Purge	The system LRS Purge can completely remove a LRS in the Archive state from the FMT system.

6.3.1.3 Alternate LRS

FIG. **11** describes in detail the functions of an Alternate LRS.

Alternate LRS State definitions are the same as Primary, but are limited to Private, Publish, and Delete.

6.3.1.4 Alternate LRS State Transitions

From State	To State	Action	Notes
<null>	Private	User: LRS Create	The LRS Create function creates a LRS in the Private state.
Private	Publish	User: LRS Publish	The LRS Publish function can change an LRS to the Publish state.
Publish	Private	User: LRS Un-Publish	The LRS Un-Publish function can change an LRS to the Private state from the Publish state.
Private or Publish	Delete	User: LRS Delete	The LRS Delete function can change an LRS to the Delete state from the Private or Publish states. Also the LRS Hand-off function can change all Alternate associated LRS to Delete.
Delete	Private or Publish	User: LRS Undelete	The LRS Undelete function can change an LRS to its previous state (Private or Publish) from the Delete state. An Alternate LRS with the Primary LRS in Design state can not be Undeleted.
Delete	<null>	System: LRS Purge User: LRS Purge Deleted	The system LRS Purge function or user LRS Purge Deleted function can completely remove a LRS in the Delete state from the FMT system.

6.3.2 Provide Location Relief Strategy Administration Tool

6.3.2.1 Create a LRS and Associated Administrative Data

Embodiment	Provide User with the ability to create a LRS and associated administrative data
Description	User should be able to create a Location Relief Strategy using the tools available. In order to create a LRS, the user should have set some sort of location - a start and an end point. A user should also be able to create administrative data to go along with the LRS. This administrative data can be such things as creator name, creation date of an LRS, last modified date, status type, etc.
Data	See Data Embodiments: LRS & Hand-Off Package
General Discussion	LRS overview - new concept/ feature called NEED. This is the highest level of LRS hierarchy. A NEED may be satisfied by one or more LRSs. An LRS may have one or more solutions. However, according to some embodiments of the present invention, only one LRS may be defined as a primary LRS, and all other LRSs are defined as alternatives. In some other embodiments of the present invention, more than one LRS may be defined as a primary LRS for a need.
Spatial Embodiment	<NEED and LRS is initiated/ created in FAS. LRS creation in Spatial is instigated by a call from FAS (LRS cannot be created within Spatial; it is first be created in FAS)> there is a function in FAS that allows user to kick off Spatial to create a LRS in spatial; FAS passes us needed admin info (unique id, user, etc,) to create new 'folder' in our tree view. User identifies point(s) of interest, etc.
Spatial to FAS I/F	Launch FAS' 'Create LRS web page';

Scenario:

User selects location from Spatial and selects "Create LRS"
FAS web page opens and user creates new LRS

Data elements that should be displayed on the FAS screen:

Location(s), CSA, Address, CLLI, GLC, Easement_ID, Easement Size (x,y in feet), Easement Comments, Text of Easement and Restrictions, Power Embodiments, Point(s) of Interest, Fiber Strand, Fiber Connectors, Service Date, Customer Name, Customer Contact, Contact Info, Trigger, Prog Codes, All LecIII data in LecIII interface, All PM Tool data in PM Tool interface, All TEOPS data in TEOPS interface, Xbox(s) associated with LRS, Xbox snapshot (Xbox FG/SG summary screen at time associated with LRS), Contact Name, Contact Reason, Equipment Data (see Appendix A1.3), New Development Data

6.3.2.2 Create Alternative LRS and Associate for a Route

Embodiment	Provide User with the ability to create an alternative Location Relief Strategy associated for a route.
Description	Users should be able to create an alternative LRS for a particular route. This is can be as a fallback or just an alternative for a route. The user can set the main LRS as primary if he/she wants and the second or third as alternatives. At least one of the LRS created by the user must be a Primary; any others created would be alternative.
Data	See Data Embodiments: LRS & Hand-Off Package

Scope for FAS:

Manage creation of alternative LRS and changing of Primary and Alternative statuses

Scenario:

While working with a LRS user decides to create an alternative. User selects "Create Alternative LRS" link. The system asks if the user wants to clone an existing LRS. User selects Yes. A new LRS is created using all of the same data as the selected LRS.

Data elements that should be displayed on the FAS screen:

Same data as Primary LRS

6.3.2.3 Modify LRS Administrative Data

Embodiment	Provide the appropriate user the ability to modify the administrative data of a LRS.
Description	Administrative Data includes data such as date LRS was created, status of LRS, creator, etc. It may include all data that can be administered about the LRS, except for the LRS itself. The user who created the LRS, the user's alternative, and/or a super user have permissions to modify the administrative data of a LRS. A user is able to modify an LRS till the handoff state.
Data	See Data Embodiments: LRS & Hand-Off Package
Scenario:	

LRS decides to modify existing LRS. User selects "Modify LRS" link. Editable fields are no longer write protected and user can modify and then save.
Data elements that should be displayed on the FAS screen:

Same as Primary LRS

6.3.2.4 Save and Retrieve LRS and Administrative Data

Embodiment	Provide user with the ability to save and retrieve LRS (Location Relief Strategy).
Description	User can save unfinished LRS and retrieve them when needed. The users who have permission set can save a LRS and retrieve it later to make changes or additions. Once the user has created a LRS, he/she can have the option to "publish" proposed routes or maintain it as "private". Published routes are available for viewing by other FMT users. Private routes are only available to the owner/author as well as the administrators, so that they can help with support issues. This is provided only if a minimal amount of information (such as POI (point of interest)) has been entered.
Data	See Data Embodiments: LRS & Hand-Off Package
System Behavior	At a user's request, FMT can save the current LRS within its database. Users can retrieve a LRS based on search criteria or from a list. FMT can also provide the ability to retrieve the saved LRS by selecting the file name from a list. This data is corporate data and should be stored in corporate server.
Users	Loop Capacity Mangers, Long Term Planners, Infrastructure IOF Planners.
Scope for FAS:	

Manage searching of LRS based on tabular data; display LRS upon request from Spati
Scenario:

User searches for LRS based on key word. A list of matching LRS's are returned. User selects desired LRS, LRS screen is displayed.
Data elements that should be displayed on the FAS screen:

Same as Primary LRS.

6.3.2.5 Logically Delete LRS and Associated Data

Embodiment	Logically Delete LRS and Associate Data
Description	User should be able to delete a LRS and it's associated administrative data, which can logically perform a delete. The only users allowed to do this are the creators of the LRS, its alternate, and a super user. The data can be deleted from the user's perspective, but can remain in storage until purged. User can decide to delete LRS from either Spatial or FAS Web; upon deletion in one application the LRS is deleted from the other.
Users	Loop Capacity Mangers, Long Term Planners, Infrastructure IOF Planners.
Spatial Embodiment	Logical delete is supported. Life cycle closures, i.e., via PMTool, is managed by FAS. FAS sends update to Spatial to logically delete LRS/data. Manual deletes, i.e., deleted by a user, can be performed in either FAS or Spatial (PLEASE CONFIRM). In this case, system in which the delete is initiated sends update to the other system to perform logical delete of LRS/data.
Scope for FAS:	

Manage the LRS lifecycle.
Scenario:

User decides that a particular LRS is not required and should be deleted; User selects delete; LRS is changed to the Deleted state.

6.3.2.6 Purge LRS and Associated Data

Embodiment	Purge LRS and Associated Data
Description	LRS and their associated data can have a logical delete flag associated with them so that a corporate purge process can purge periodically based on a BST defined criteria.
Data	Existing Location Relief Strategies saved by user groups
Spatial Embodiment	Purge interval & instruction is maintained in FAS. FAS

-continued

	notifies Spatial to Purge (physically delete) LRS/data.

Scope for FAS:

Manage the LRS lifecycle.
Scenario:

After an LRS has been in the Archive state for 'x' days it can be purged.

6.3.2.7 Create, Modify, and Delete LRS Notes by User

Embodiment	Create, Modify, and Delete LRS Notes by User
Description	User can create, modify, and delete LRS notes. The LRS can go through the process of create, publish/un publish, handoff, complete, delete, and purge. Once an LRS has been published any user with access to FMT can create and add LRS Notes. LRS notes cannot be deleted; as a user adds a note, the user's name, ID, and the date/time stamp are recorded. A LRS note should be viewable in the FAS LRS screen.

Data	Data Description	Source (Primary, Secondary)
User Name	User's First, Middle, and Last Name	Siteminder
User ID	UID	Siteminder
Date/Time	Date	System
Comment	Long text	User

Scope for FAS:

Allow user to create LRS notes.
Scenario:

User selects LRS. User selects "Add LRS Note" and enters desired information.

6.3.2.8 Provide LRS Reports by User Selection Filters

Embodiment	Provide LRS Reports by User Selection Filters
Description	User can filter out and select a particular LRS or search for one using filters that show what they would like to view.
Data	See Data Embodiments: LRS Search

Scope for FAS:

Allow user to search for LRS based on key words. Many, but not all fields, should be searchable. To search for deleted and canceled LRS's the user should explicitly specify that the search should include those LRS's. Private LRS's are displayed with minimal data, but users other than the creator cannot see any additional data.
Scenario:

User selects LRS search screen. User enters search criteria. A list of LRS's is displayed.
Data elements that should be displayed on the FAS screen:

LRS ID, Scope of Work, Location(s), Xbox(s), Primary/Alternative, Service Date, Trigger, LRS status (published, handed off, etc.)

6.3.2.9 Close an LRS Manually

Embodiment	Close an LRS Manually
Description	User can be able to close an LRS manually

Scope for FAS:

Manage LRS Life Cycle
Scenario:

Once a LRS has been handed off the user decided that the LRS should enter the closed state (for example, there is no EWO for the LRS). The LRS is canceled and is no longer shown as an active LRS.

6.3.2.10 Alert Overage Service Dates on LRS

Embodiment	Alert Overage Service Dates on LRS
Description	User can be provided with an alert of overage LRS x days after planned service date

Data	Data Description	Source (Primary, Secondary)

Scope for FAS:

Modify the Main Screen to create a notification for Overage LRS.
Scenario:

LRS has a service date of X. On day X + 30 the creator of the LRS logs into FMT and finds an alert that there is an overage LRS. The user selects the link to the list of overage LRS's and selects the LRS. The user then modifies the service date so that the LRS is no longer overage.
Data elements that should be displayed on the FAS screen:

LRS ID, Scope of Work, Location(s), Xbox(s), Service Date
Source for all the data elements for this embodiment:

FAS

6.3.2.11 Dependent LRS Clone

Embodiment	Dependent LRS Clone
Description	User can build a new LRS upon one or more LRS's. The status of the facilities which are proposed in the preceding LRS's is changed to "proposed existing." The tabular data includes links to the LRS's on which this LRS is dependent. When a new LRS is cloned from another LRS on which it is to be dependent, all data is copied, and it is the user's responsibility to choose which data should be deleted.
Spatial Embodiment	When a user is viewing a LRS, the facilities on which it is dependent are shown as "proposed existing"

Scope for FAS:

Manage LRS cloning and dependent LRS links.
Scenario:

User selects LRS and selects "create clone". User then opens cloned LRS and enters other LRS's on which it is dependent. FAS

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shows these LRS's, along with their service dates, in the LRS screens
Data elements that should be displayed on the FAS screen:
Preceding LRS's and service dates
Source for all the data elements which are required for this embodiment:
FAS

6.3.3 Provide Graphical and Tabular Planning Tools

6.3.3.1 Generate LRS Schematics from Existing Fiber Data

Embodiment	Provide user the ability to generate a LRS schematic from existing fiber data
Description	Using the graphical tools in FMT, users with the appropriate permissions can generate a LRS schematic from existing fiber data storage.
Spatial Embodiment	View that contains only data associate with (to) an LRS.
Embodiment	Provide drawing tools and symbols to denote all necessary equipment and facility items within the Location Relief Strategy (LRS).
Description	Symbols can be consistent with existing .DGN and .LND symbology.
Data	See Data Embodiments: LRS & Hand-Off Package
System Behavior	Users can have a palette of symbols that represent facilities and landbase features to select from in order to draw a LRS for future fiber optic routes.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners.
Spatial Embodiment	Provide placement of planned & planned existing features, complements, annotation, etc. Attribution of features can be possible but not enforced or validated.

6.3.3.2 Provide Drawing Tools, Symbols, and Attribute Creation Functions

Embodiment	Provide drawing tools and symbols to denote all necessary equipment and facility items within the Location Relief Strategy (LRS).
Description	Sybols can be consistent with existing .DGN and .LND symbology.
Data	See Data Embodiments: LRS & Hand-Off Package
System Behavior	Users can have a palette of symbols that represent facilities and landbase features to select from in order to draw a LRS for future fiber optic routes.
Users	Loop Capacity Managers, Long Term Planners, IOF Planners.
Spatial Embodiment	Provide placement of planned & planned existing features, complements, annotation, etc. Attribution of features can be possible but not enforced or validated.

6.3.3.3 Document Future Location Relief Strategy, and/or DLE locations

Embodiment	Provide users with the ability to document Location Relief Strategy and/or DLE equipment.
Description	The user can have an option to draw/document a future fiber route and DLE equipment using tools provided in FMT. Users can also either set each LRS as private or publish them.
Data	See Data Embodiments: LRS & Hand-Off Package
System behavior	Users can have a variety of tools to select from and can document and/or draw a future LRS, depending on user permissions.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners.

6.3.3.4 Retrieve and Display LRS

Embodiment	Provide users with the ability to retrieve LRS with a user- defined job description and display on screen.
Description	The user can have the option to "publish" LRS or maintain it as "private." Published routes are available for retrieving and displaying on screen by other FMT users. Private routes are only available to the owner/author.
Data	See Data Embodiments: LRS & Hand-Off Package
System Behavior	FMT can also provide the ability to retrieve or search for a LRS from its database or from a list. This data is corporate data and should be stored in corporate server.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners.

6.3.3.5 Display Multiple LRS Graphically

Embodiment	Provide users with the ability to retrieve multiple LRS with a user- defined job description and display them on screen.
Description	Users can display multiple LRS at one time in order to compare more than one at a time, etc.
Data	See Data Embodiments: LRS & Hand-Off Package
System Behavior	FMT can also provide the ability to retrieve or search for a LRS from its database or from a list. After selecting the LRS desired, FMT can retrieve the LRS and display it on screen. The user can select another LRS or search for another in order to view more than one at a time. This data is corporate data and should be stored in corporate server.

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Users	Loop Capacity Mangers, Long Term Planners, IOF Planners.
Spatial Embodiment	User can select one or more LRS to view. User desires to be able to visually distinguish one LRS from another. User can link from facilities associated with one LRS and see the details in FAS

6.3.3.6 Copy Existing LRS to New LRS

Embodiment	Provide user with the ability to copy an existing LRS into a new LRS. **Described above**
Description	Users can take a previous LRS already created within FMT and copy it to a new LRS in order to use it further or make additions/changes. This copy can be used as a brand new LRS, as an alternative to the original in addition to the original, or converted to "assumed existing" for a new LRS.
Data	See Data Embodiments: LRS & Hand-Off Package
System Behavior	The system can take the original LRS and copy it to a new page.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners

6.3.3.7 Modify LRS

Embodiment	Provide user with the ability to modify a proposed LRS
Description	Only creators/designers can modify LRS. In addition, FMT can store an audit trail of modifications to each LRS.
Data	See Data Embodiments: LRS & Hand-Off Package
System Behavior	Users retrieve specific LRS through the on-screen interface, and edit or delete them.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners
Spatial Embodiment	Once published, track changes made to LRS by any/all users. Track all state changes. Any LRS (primary or alternatives) can be modified until an LRS reaches the 'build' state. When the primary LRS reaches the 'build' state, alternatives are 'frozen' and cannot be modified. At this point, alternatives could be logically deleted. A primary LRS can be modified until it reaches the 'complete' state (handed off).

6.3.3.8 Publish LRS

Embodiment	Provide users the ability to publish a LRS in order for other users to view and add comments, etc.
Description	Users with appropriate permissions can publish a LRS they have created in order for other users to view and add comments and suggestions to them. The original user who created the LRS has the option of publishing the LRS (for everyone to view) or making it private (for no one to view)
Data	See Data Embodiments: LRS & Hand-Off Package
System Behavior	Users view a LRS that have been set to publish through FMT and its on-screen interface.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners.

Scope for FAS:

Manage LRS life cycle

Scenario:

User selects private LRS for which he is the owner. User selects "Publish LRS" and LRS is now viewable to other users.

Data elements that should be displayed on the FAS screen:

LRS details

Source for all the data elements which are required for this embodiment:

FAS

6.3.3.9 View LRS and DLE Plans

Embodiment	Provide users the ability to view a LRS and DLE
Description	Same as embodiment
Data	See Data Embodiments: LRS Search
System Behavior	Users can view the LRS and DLE associated with it from within FMT for a particular LRS or searching for one. The user can view a LRS according to their user permissions.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners.

6.3.3.10 View Multiple LRS for Same Geographic Area

Embodiment	Provide users with the ability to view multiple Location Relief Strategies for same geographic area.
Description	Same as embodiment
Data	See Data Embodiments: LRS & Hand-Off Package
System Behavior	Users can view multiple Location Relief Strategies for the same geographic area. The LRS is distinguishable from one another. The user may have one

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	or more LRS on-screen at any given time. The user can toggle this feature on and off.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners.

6.3.3.11 Capture LRS Notes Associated with a Graphical Feature by User

Embodiment	Capture LRS, and information about the LRS notes -- including the date created and the user that entered the comment.
Description	Same as embodiment
Data	None
System Behavior	The system should provide a freeform field that captures LRS notes. The system should assign the current day's date in a separate field.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners.

6.3.3.12 Manage Graphical Feature LRS Notes by User

Embodiment	Provide user with the ability to manage LRS notes through a graphical feature by user.
Description	Same as embodiment
Data	Same data as for a tabular note, but associated with planned feature rather than tabular LRS.
System Behavior	Users with the access to FMT can enter LRS notes through a graphical feature. The system can output the request by user.
Users	All FMT users

6.3.3.13 Link to Tabular LRS Data at Location Features

Embodiment	Provide an internal link to tabular LRS data at location features
Description	Same as embodiment
Data	None
System Behavior	User interface can interact with a link to the tabular planning data.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners

6.3.3.14 Measure Strand Distances

Embodiment	Measure both horizontal and loop distances for a Location Relief Strategy (LRS)
Description	System measures strand distance in feet or meters.
Data	None
System Behavior	User interface can assign appropriate distance based on scale of current on-screen view.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners

6.3.3.15 Provide View Printing

Embodiment	Print all views available on-screen.
Description	The FMT client can support all Windows-standard functionality including save, print, cut, paste, copy, portrait, landscape, paper size, etc. In addition, the client can provide the user with the ability to assign a title to the printed document.
Data	None
System Behavior	System can print all views, including graphical (geographical and facilities) and tabular data of an LRS.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners
Spatial Embodiment	Allow user to print graphical representations of LRS
Scope for FAS:	
Print LRS tabular data	
Scenario:	
User selects Print. LRS details are printed	
Data elements that should be displayed on the FAS screen:	
LRS details	

6.3.3.16 Create an Equipment Plan Associated to a LRS and Location

Embodiment	Create an equipment plan associated to a LRS and location.
Description	Same as embodiment
Data	None
System Behavior	System should have the ability for the user to create an equipment LRS that is associated with its location and LRS ID.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners

6.3.3.17 Create Fiber Strand Plans Associated to LRS and Sheath

Embodiment	Create Fiber Strand Plans associated to a LRS and Sheath.
Description	Same as embodiment
Data	None
System Behavior	System should allow users to create fiber strand plans that are associated with Location Relief Strategy and sheath.
Users	Loop Capacity Mangers, Long Term Planners, IOF Planners

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Spatial Embodiment	User can modify complement data of existing facilities as a part of a LRS.

Scope for FAS:

FAS captures Fiber interest, but user must manually enter fiber strands in LRS tabular; there is not check between Spatial and FAS for a fiber interest

Scenario:

User opens a LRS. User modifies complements on existing fiber sheaths so that desired fiber strands are energized in the desired manner. User then opens the LRS detail screen and enters the desired fiber strands in the Fiber Strand field. An interest is then created.

Data elements that should be displayed on the FAS screen:

Logical strand

Source for all the data elements which are required for this embodiment:

user

6.3.3.18 Provide Summary Reports

FMT can have the ability to generate summary reports on a company's fiber optic assets. In summary, and at minimum, FMT can produce the following information:

Report	Description
Central Offices by District	The report includes summary information of Central Offices (Wire Centers) by District.
Equipment by Central Office	This report includes all fiber-related equipment, and summary information of that equipment, associated with a particular Central Office.
Equipment by Remote Terminal	This report includes all fiber-related equipment, and summary information of that equipment, associated with a particular Remote Terminal.
Equipment, Plant Assets by Fiber Strand	This report includes all fiber-related equipment, and summary information of that equipment (including location) associated with a particular Fiber Strand.

6.3.3.19 Create Ad Hoc Monitoring Queries and Reports

Embodiment	Create Ad Hoc monitoring queries and reports for specialized and unpredictable monitoring tasks.
Description	Reports may be design and saved from a separate application, but report record selection, previewing, and writing must be integrated into FMTs planning layer.
Spatial Embodiment	Provide spatial query capabilities in a user-friendly manner which also prevents users from creating dangerous, unworkable, or "expensive" queries

Scope for FAS:

Create a means of 1) creating custom reports and 2) saving the requests so that the reports can be reproduced.

This tool should be capable of querying data related to equipment Xbox, CSA. Fiber, and LRS and performing joins. The user should be able to specify field, operator (=, >, <, Like), value (including wildcard), and and/or relationship. This embodiment may not include the ability to perform mathematical operations (sum, percent, etc.) but the user may be able to save the result set so that it may be opened in another application for that purpose.

Data elements that should be displayed on the FAS screen:

As requested by user

Source for all the data elements which are required for this embodiment:

FAS datawarehouse

6.3.3.20 LRS Handoff Package

Embodiment	LRS handoff data that describes the Location Relief Strategy must be accessible by other users and the PM Tool.
Description	The document must meet the minimum handoff embodiment as described.
Data	See Data Embodiment: LRS & Hand-Off Package

Scope for FAS:

Upon user selecting "handoff" pass appropriate data to PM Tool in a realtime manner.

Scenario:

User selects LRS. User ensures that LRS is 1) primary and 2) published. User then selects "handoff." A PM Tool document is automatically generated.

Alternatively:

User selects a private, alternative LRS. User attempts to generate handoff package. System notifies user that the LRS must first be published and primary, would the user like to do this now; if so then primary LRS "x" must become alternative, proceed?

User selects proceed, and a PM Tool document is automatically generated.

Data elements that should be displayed on the FAS screen:

See PM Tool interface

Source for all the data elements which are required for this embodiment:

FAS

6.3.3.21 Monitor Facility and Fills

Embodiment	Monitor facility and fills by generating actual and forecasted network usage.
Description	FACILITY PLANNERSs need to generate, view, print reports of actual and forecasted network usage. Reports should be available at various levels of the network segments. Monthly details: these reports list usage statistics by month for a 12-month period. History and Forecast: these reports list usage statistics by year, as well as disconnects, and defects in the past By service category and architecture: these reports list network usage organized by type of service and system architecture

6.3.3.22 Provide Inventory Tasks on Equipment/Site Details

Embodiment	Provide information for inventory tasks on existing and proposed equipment and site details.
Description	FMT must provide access to individual network elements starting from a district at the top of the inventory hierarchy.
Scope for FAS:	
Existing iView functionality for all equipment, not just that which is found in LEIM.	
Source for all the data elements which are required for this embodiment:	
Same as iView functionality today.	

6.3.3.23 Maintain Editing History

Embodiment	Maintain editing history of each Location Relief Strategy (LRS)
Description	The history can consist of a list of modifiers and the date of their last change.
Scope for FAS:	
Maintain list of users and timestamps of edits	
Scenario:	
User selects LRS and makes modifications. User's ID and timestamp are recorded and displayed upon request.	
Data elements that should be displayed on the FAS screen:	
User name, ID, timestamp	
Source for all the data elements which are required for this embodiment:	
FAS	

6.3.3.24 Create "Publish" Pop-Up Window

Embodiment	Create a pop-up window every time a user exists his/her planning screen
Description	Once the user has finished a session of creating a LRS and wants to exit and log out - the system can pop up a screen and ask the user: Do you want to Publish? The user can click on Yes or No-Remind me in___ days. (The number of days can be determined in the design stage)
Scope for FAS:	
Create Publish "nag screen"	
Scenario:	
User selects LRS and makes edits. Upon clicking the Save button the user sees a screen which encourages him to publish the LRS.	
Data elements that should be displayed on the FAS screen:	
Publish "nag screen"	
Source for all the data elements which are required for this embodiment:	
Publish popup screen with yes/no buttons	

6.4 Exit, Session, Recovery, and Cleanup

The FMT client can exit gracefully. Upon exit, the client can perform all necessary cleanup for any locally stored, temporary files. If a user's session is interrupted (due to a power outage for example), the client can have the ability to recover the session.

6.5 Performance

FMT should be pleasant for user to user; the application should respond to users' selections quickly. Action should be taken to ensure that user wait time is minimized. This goes for both the graphical and tabular tools. For example:

1) Interactive task response times—2 seconds or less.
2) Creation of print file in less than 2 seconds (file size 1 MB).
3) Design session startup
   a) From File (4 MB of graphics)—15 seconds or less
   b) From database—1 minutes or less
4) User interface is event driven (users must understand mouse movements).
5) Screen refreshes—3 seconds or less.
6) Standard data queries—3 seconds or less.
7) Minimum mouse travel.
8) Optimum Use of Keyboard and mouse interactions (minimized user movements required).
9) Response time on customer tools as good as standard tools.

7 External System

Purpose: This section describes embodiments for the interfaces between OPEDS and the various external systems that can provide data for FMT. Data transmission in the network can comprise proprietary and open standards and methodologies.

Discussion: Data transmission in the network can involve the use of external system interfaces (or "contracts") that are implemented using one of the following accepted communication standards listed below (see Table 3)

TABLE 3

Standard Communication Methods	
BUFIT	A file-based transmission method, BUFIT is most often used to send multiple records of data in a single file from one system to another. BUFIT transactions are normally associated with batch processes (i.e. each night a system sends all of the current day's order records to the archive system).
Navigator[1]	A structure-based transmission method, Navigator is used to send memory structures from one system to another. Navigator transactions are normally associated with interactive processes and can sometimes involve query and response scenarios (i.e. System A sends a request to System B for data, System B interactively sends data back to System A).
Orbix	Orbix provides an Object Request Broker (ORB) that behaves like Navigator in that it is most often used for immediate transactions between interactive processes.

Each contract can have an associated version number (e.g., the first, "0001," the second "0002" and so on). A process can assign the next version number if the contents of the contract change, such as the addition of a new field or possibly a change in the expected contents of an existing field. All programs initiating contracts can tag them with appropriate version numbers. Furthermore, all receiving programs should recognize the version of the contract upon receiving them, and act on that version appropriately. For example, if a con-

tract is on its third version, the program that receives the contract should accept versions 1, 2 or 3 of the contract and process it accordingly.

The OPEDS Process/Data management layer can manage the process of sending all outgoing contracts from an OPEDS point of view as well as receiving all incoming contracts from an OPEDS point of view. This can include storing and retrieving the data for other processes requesting the data.

Specific information for each of FMT's external system interfaces is outlined below.

Note: FMT may acknowledge positive receipt of the data.

7.1 External Systems Communications

7.1.1 LECIII

System Overview	Loop Electronics Coordination Version 3 (LEC III) is a mainframe based budgeting, scheduling, forecasting, and tracking toll for DLC equipment. It stores equipment, cost, and scheduling information along with user plans for DLC work with which provides information through a series of reports and an ad hoc query system.
Embodiment	The FMT system can establish a "process" type of interface with LEC III in which users can receive data in FMT based upon the entry of LECIII ID.
Process	The LEC III ID entered into FMT, a process can then be triggered that can retrieve the data associated with the ID.
Response	FMT must acknowledge positive receipt of the data. Data is then displayed in FMT.

7.1.1.1 LEC III Data Embodiments

Fields	Description	Data Type	Max. Char.
LEC III ID	Numbering scheme brought over by LEC		
Equipment Type	Product description of DLE equipment		
Quantity	Total number of a specified equipment type		
#System	System number of system to be turned up		
Mode	Mode "I" "II" or "III"		
TR303 Line	DLC type		
#DS1 Req.	Required number of DS1s		
DLC System Type	Manufacturer code		
TR303/Tr008	Terminal type		
RDSC	Code to be used to order equipment associated with this LRS (may be manually entered or fed from LECIII)		

7.1.2 LOC/CLLI

System Overview	This system is used to request Area Numbers and CLLI Code Information. Users can retrieve existing CLLI codes or submit requests to CLLIADM via Open Mail to create new codes, modify and delete existing codes. This system is integrated with LEC III.
Embodiment	The LOC/CLLI system can transmit the specified data elements to FMT within the agreed upon time frame nightly, including weekends. The data from LOC/CLLI should be a "delta" from the last data set that was indicated as successfully received from FMT. FMT can load the data from LOC/CLLI within a timeframe that is acceptable based on the amount of data received from LOC/CLLI and the necessary business rules.
Response	FMT must acknowledge positive receipt of the data.

7.1.3 LFACS

System Overview	LFACS (Loop Facilities Assignment and Control System) - LFACS is an inventory and assignment system for the outside plant (local loop) facilities which support DS0-level (and, in some cases, DS-1-level) services. LFACS maintains an inventory of customer locations and the outside plant facilities, which serve each location.
Embodiment	Execute inquiries and reports against the LFACS database from within a FMT session.

7.1.4 FOX/DSX/TEOPS

System Overview	FOX (Fiber Optic Connect System) Module of TEOPS (Telephone equipment processing system) where DSX or LGX assignments are made when new equipment is added to a central office.
Embodiment	FOX can transmit the specified data elements to OPEDS within an agreed upon time frame nightly, including weekends. The data from FOX should be a "delta" from the last data set that was indicated as successfully received from OPEDS. The OPEDS system can load the data from FOX and the necessary business rules.
Response	OPEDS may acknowledge positive receipt of the data.

7.1.4.1 FOX/DSX Data Embodiments

Fields	Description	Data Type	Max. Char.
Bay Panel Jacks LTR	Identifier for the bay and panel		

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Fields	Description	Data Type	Max. Char.
Assigned equipment	Type of assigned equipment to a bay		
Assigned location	Location of the equipment		
Unit/shelf	The shelf number		
Circuit	Type of circuit		
TEO	Associated unique identifier used to place equipment		
Note	Remarks field		

7.1.5 TIRKS

System Overview	Inventories all special circuit and central office information.
Embodiment	TIRKS can provide current data within 24 hours. There may be two possible ways to accomplish this: 1) receive bulk data sets from TIRKS on a nightly basis, or 2) establish a "query and response" type of interface with TIRKS in which FMT users can request current data. The first option may be preferable so long as the data is such that TIRKS can provide OPEDS with "deltas" and the amount of data is such that the OPEDS database can store it redundantly.
Response	OPEDS must acknowledge positive receipt of the data.

7.1.6 LEIM

System Overview	LEIM (Loop Equipment Inventory Module) Corporate repository of OSP Digital Loop Electronics Data.
Embodiment	LEIM can provide current data within 24 hours. There may be two possible ways to accomplish this: 1) receive bulk data sets from LEIM on a nightly basis, or 2) establish a "query and response" type of interface with LEIM in which FMT users can request current data. The first option may be preferable so long as the data is such that LEIM can provide OPEDS with "deltas" and the amount of data is such that the OPEDS database can store it redundantly. The design phase can examine this issue further. The existing LEIM extract for FAS can be modified
Embodiment	Allow user to send "update" data for 1 location
Description	It is feasible to have a request and response between FMT and LEIM to get a Location update. It could be batch, possibly overnight, using FTP if variances are approved

7.1.7 BCM

System Overview	The Telecommunications Company Construction Management system is a web-based application designed to assist in planning, forecasting, tracking, and controlling capital retirement and maintenance budgets for Central Office Equipment (COE), Outside Plant (OSP), Land and Building (L&B), and Plug-in Authorizations.

7.1.8 PM TOOL

System Overview	PM TOOL (Project Management Tool), serves as a shared database between BST and the Supplier in which all identified engineering embodiments can be logged and then tracked from identification through completion.
Embodiment	FMT can establish a "process" type of interface with PM TOOL in which users can receive data in FAS based upon the entry of certain data elements. The FAS tables can contain PM Tool data elements i.e. PM Tool ID, date(s) etc. When the ID or other predetermined data element is entered into FMT, a contract can be triggered that can retrieve the associated data and display the appropriate information in FAS.
Process	User generates a hand-off package
Response	All LRS data is sent to PM Tool. Once the data is received PM Tool returns a PM Id.

7.1.8.1 PM Tool Data Embodiments

Fields	Description	Data Type	Max. Char.
PM Tool Id	PM Tool item# (unique in component)		
LRS Id	FAS LRS ID (unique in FAS database)		
Wire Center	Wire center CLLI for this plan		
Location	Location of plan		
Job Title	User defined short description of work to be performed		
EWO	Auth number fed from PM Tool to FAS Plan		

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Fields	Description	Data Type	Max. Char.
Local Category	Used in PM Tool to categorize work		
Metrics Category	Used in PM Tool to categorize work		
Taper Codes	Numerical representation of an interface to be monitored		
Associated PM Tool	Used in PM Tool to associate other PM Tool items		
Scope	Free form description of work to be performed		
Status	Free form description of status of LRS or handoff document to be performed		
FACILITY PLANNERS	Owner of FAS plan		
Copper Sizing Criteria	Free form instructions concerning how copper cables should be sized on this plan		
Cable Count	Copper cable name and pair range to be used in this plan		
Fiber Sizing Criteria	Free form instructions concerning how fiber cables should be sized on this plan		
Cable Count	Fiber cable name and pair range to be used in this plan		
Mandatory Splice Location	Free form comments indicating required splice points in a LRS involving fiber		
Service Required	Date by when FACILITY PLANNERS believes service is required for this plan		
Approval Date	Date when the auth number associated with the PM Tool document is approved in JMS		
Hand-Off Date	Date when hand off package is generated (FAS LRS is entered into PM Tool)		
Construction Close Date	Date when auth number associated with the PM Tool document is closed in OSPCM		
Cancellation Date	Date when auth number associated with the PM Tool document is cancelled in JMS		
Permit Type	Type of permit required		
Grantor	Grantor of permit		
Date Permit Received	Date notification of approval of permit received		
Date Permit Requested	Date approval of permit requested		
Easement Required	Yes/no indicator of whether an easement can need to be obtained as a part of this plan		
Date Easement Requested	Date easement requested		
Date Easement Received	Date easement received		
Co Mux Location	Relay rack location of Central office Mux		
Fiber Assignment	Fiber assignment for connecting equipment		
Co LGX Position	Central office bay location of the central office LGX		
TEO	Associated TEO which places equipment for this plan		
RDSC Code	Code to be used to order equipment associated with this LRS (may be manually entered or fed from LECIII)		
Clli	LOC_CLLI of remote terminal		
Area Number	Tax code associated with RT LOC_CLLI		
Address	Address of remote terminal where work is to be performed		
Site#	CSA or location ID of remote terminal where LRS is to take place		
RT Type	Structure type		
Channel Banks Added	Number of channel banks to be added on this plan		
Commons Added			
DLC	Indicates whether system is to be turned up as integrated or universal. PM Tool currently only supports these options, a modification should be made to also accept TR303). This field may be modified further to indicate the turning up of a Mux		
COT	Position of central office connection (COT location or switch peripheral bay/panel/jack location)		
DS1 Assignment	FACS cable pair(s) which can feed the system being turned up		
System Type	System type (s1c5, discs, etc.)		
Mode	Indicator of number of DS1's being used to turn up the system		
System#	System number of system to be turned up		
Count	Cable name and pair range to originate from this piece of equipment		
Fitl Out Count	Cable name and pair range to originate from this piece of FITL equipment		

7.1.9 TEOPS

System Overview	TEOPS is the tool which is used for creating and monitoring Telephone Engineering Orders.
Embodiment	FMT may transmit data to and retrieve data from TEOPS on an as needed basis. These transactions can be real time.

-continued

Process	TBA
Response	All LRS data is sent to PM Tool. Once the data is received PM Tool returns a PM Id.

8 Data Embodiments

8.1 LRS & Hand-Off Package

Data Item	Description	Data Type	Max. Char.	Source (Primary, Secondary)
LRS Id	FAS LRS ID number (unique in FAS database)			
PM Tool Id	PM Tool item# (unique in component)			
Comment	Free form field for comments which should be stored but not included in the handoff package			
Equipment ID	LEIM unique wire center Identifier			
Entity	PM Tool entity (derived from ST/NVP)			
Component	PM Tool component (derived from WC district)			
Mux Ports	Muldem/Slot/Port assigned to a system being turned up.			
Status	Indicator of whether LRS is public or private and if a handoff package has been generated			
Wire Center	Wire center CLLI for this LRS			
Location	Location of LRS address			
Job Title	User defined short description of work to be performed			
EWO	Auth number fed from PM Tool to FAS LRS			
Local Category	Used in PM Tool to categorize work			
Metrics Category	Used in PM Tool to categorize work			
Taper Codes	Numerical representation of an interface to be monitored			
Associated PM Tools	Used in PM Tool to associate other PM Tool items			
Associated LRS	Associates current LRS with other FAS LRS			
Associated Facility Route	Associates current LRS with FMT proposed facility routes			
Scope	Free form description of work to be performed			
Status	Free form description of status of LRS or handoff document to be performed			
FACILITY PLANNERS	Owner of FAS LRS			
Copper Sizing Criteria	Free form instructions concerning how copper cables should be sized on this LRS			
Cable Count	Copper cable name and pair range to be used in this LRS			
Fiber Sizing Criteria	Free form instructions concerning how fiber cables should be sized on this LRS			
Cable Count	Fiber cable name and pair range to be used in this LRS			
Mandatory Splice Location	Free form comments indicating required splice points in a LRS involving fiber			
Service Required	Date by when FACILITY PLANNERS believes service is required for this LRS			
Approval Date	Date when the auth number associated with the PM Tool document is approved in JMS			

-continued

Data Item	Description	Data Type	Max. Char.	Source (Primary, Secondary)
Hand-Off Date	Date when hand off package is generated (FAS LRS is entered into PM Tool)			
Construction Close Date	Date when auth number associated with the PM Tool document is closed in OSPCM			
Cancellation Date	Date when auth number associated with the PM Tool document is cancelled in JMS			
Permit Type	Type of permit required			
Grantor	Grantor of permit			
Date Permit Received	Date notification of approval of permit received			
Date Permit Requested	Date approval of permit requested			
Easement Required	Yes/no indicator of whether an easement can need to be obtained as a part of this LRS			
Date EasementRequested	Date easement requested			
Date EasementReceived	Date easement received			
Co Mux Location	Relay rack location of Central office Mux			
Fiber Assignment	Fiber assignment for connecting equipment			
Co LGX Position	Central office bay location of the central office LGX			
TEO	Associated TEO which places equipment for this LRS			
RDSC Code	Code to be used to order equipment associated with this LRS (may be manually entered or fed from LECIII)			
Clli	LOC_CLLI of remote terminal			
Area Number	Tax code associated with RT LOC_CLLI			
Address	Address of remote terminal where work is to be performed			
Site#	CSA or location ID of remote terminal where LRS is to take place			
RT Type	Structure type			
Channel Banks Added	Number of channel banks to be added on this LRS			
Commons Added				
DLC	Indicates whether system is to be turned up as integrated or universal. PM Tool currently only supports these options, a modification should be made to also accept TR303) This field may be modified further to indicate the turning up of a Mux			
Cot	Position of central office connection (COT location or switch peripheral bay/panel/jack location)			
Ds1 Assignment	FACS cable pair(s) which can feed the system being turned up			
System Type	System type (s1c5, discs, etc.)			
Mode	Indicator of number of DS1's being used to turn up the system			
System#	System number of system to be turned up			
Co DSX RT-Unit/Jacks	Jack assignments of DSX for COT			
Mux Rate	Indicates rate of optics and capacity of Multiplexer shelf (e.g. OC3+, OC1, OC192)			

-continued

Data Item	Description	Data Type	Max. Char.	Source (Primary, Secondary)
Tid	Target identifier for SONET devices			
SCID	Sonet Carrier Identifier			
Architecture	Indicator of architecture of fibers feeding device (e.g. diverse, collapsed)			
Count	Cable name and pair range to originate from this piece of equipment			
Fitl Out Count	Cable name and pair range to originate from this piece of FITL equipment			
LOC ID	LEIM location ID is a unique identifier with a W/C to identify a structure.			
Timeslot	Timeslot information for assignment of DS3 data in TIRKS			

8.2 LRS Search

Data Definition	Description	Data Type	Max Char.	Source (Primary, Secondary)
Wire Center Clli	Clli code for Wire Centers			
Taper Code	The taper code associated with the terminal			
Terminal Address	Address of the terminal			
LRS ID	Unique LRS identifier assigned by FAS			
PM ID	Numbering scheme brought over by PM Tool			
BCM TEO/Proj	Numbering scheme brought over by BCM.			
LEG III ID	Numbering scheme brought over by BCM.			

8.3 Facility Route Search

Data Definition	Description	Data Type	Max. Char.	Source (Primary, Secondary)

8.4 Equipment Attributes

Data Definition	Description	Data Type	Max Char.	Source (Primary, Secondary)
CLLI # (Common Language Location Identifier)	Common Language Location Identifier	Text	8	LEIM, TIRKS, LOC/CLLI and FAS
CLEI # (Common Language Equipment Identifier)	Code that uniquely identifies an item of DLE equipment	Text	12	LEIM, TIRKS
Address	Street Address	Text	20	LEIM, LOC/CLLI, FAS
Location	Location inside a CO or RT where a specific item of equipment resides	Text	12	LEIM, FAS
Equipment Type	Product description of DLE equipment	Text	30	LEIM, TIRKS, LFACS

-continued

Data Definition	Description	Data Type	Max Char.	Source (Primary, Secondary)
RDSC (Regional Design Source Code)	Code that provides a DLE equipment manufacturer's standard product configuration and prices	Text	20	LEIM
Customer Name	Name of customer served by an item of DLE equipment	Text	25	LEIM or personal notes
AWF (Alarm Wiring Configuration)	Standard configuration that corresponds to the DLE powering configuration	Numeric	4	LEIM
TEO # (Telephone Equipment Order)	Number assigned to a purchase order of DLE equipment	Text	18	LEIM, FOX
EWO # (Engineering Work Order)	Engineering work order that placed or modified that piece of equipment	Text	10	FAS, LEIM
Feeder Route #	Used for provisioning	Text	2	LEIM
Carrier #	Used for provisioning	Text	6	LEIM
Allocation #	Used for provisioning	Text	6	LEIM
Distribution #	Used for provisioning	Text	6	LEIM
Status	Assignment condition - working, assigned, spare, planned	Text	10	LEIM, TIRKS, Personal Notes

8.5 MUX

Data Definition	Description	Data Type	Max Char.	Source (Primary, Secondary)
DSX Assignment	DS1 or DS3 Termination	Text	6	TIRKS, LEIM, FOX
System #	Administration # assigned to MUXs	Numeric	4	TIRKS, LEIM, LFACS
Software Generic	Software version supporting an item of DLE equipment	Text	10	TIRKS, LEIM
TID # (Target ID)	Combination of CLLI, System Type and System Number	Text	20	TIRKS, LEIM
Wavelength	Wavelength in nanometers that equipment is operating	Text	10	TIRKS, LEIM
Bandwidth	Maximum MBs per second of data that an item of equipment can transmit	Text	8	TIRKS, LEIM
Bandwidth Capacity	Maximum Bandwidth	Text	8	TIRKS, LEIM
FOT Assignment	LGX termination point	Text	10	LEIM (loop); FOX, TIRKS (IOF)
MD Counts	MUX Distribution Counts	Text	16	LFACS, LEIM
Configuration	Sonet or Assync, and the ring configuration	Text	20	TIRKS, LEIM
SCID # (Sonet Circuit ID)	Identification number given to Sonet Mux systems.	Text	8	LEIM, TIRKS
DS3 Circuit ID	Unique DS3 or STS-1 circuit ID	Text	20	TIRKS
DS1 Circuit ID	Unique DS1 circuit ID	Text	20	LFACS, TIRKS
OCN Circuit ID	Unique OCN circuit ID	Text	20	TIRKS
Node Locations	Node ID	Text	2	LEIM

8.6 DSX

Data Definition	Description	Data Type	Max Char.	Source (Primary, Secondary)
DSX To Equipment Slot Assignment	Equipment termination location	Text	10	LEIM, TIRKS
Configuration (DS1 or DS3)	Service Termination Type	Text	4	LEIM, TIRKS

8.7 LGX

Data Definition	Description	Data Type	Max. Char.	Source (Primary, Secondary)
Equipment Slot Assignment	Equipment termination location	Text	20	LEIM, FOX
Strand Slot Assignment	Indicates which LGX port corresponds to a fiber strand from an item of equipment	Text	10	LEIM, TIRKS
Capacity	Total possible number of terminations	Text	3	LEIM, FOX

8.8 ONU

Data Definition	Description	Data Type	Max Char.	Source (Primary, Secondary)
PG Count Range	Derived counts assigned	Text	20	LEIM, LFACS

8.9 NMLI

Data Definition	Description	Data Type	Max Char.	Source (Primary, Secondary)
Circuit Id	System Circuit Id	Text	25	TIRKS

8.10 DLC

Data Definition	Description	Data Type	Max Char.	Source (Primary, Secondary)
Mode	Mode "I" "II" or "III"	Text	3	LEIM
Line Code	"AMI" or "B8ZS"	Text	4	LEIM
System Type	Manufacturer Code	Text	6	LEIM, LFACS
PG Counts (Pair Gain Counts)	Counts assigned to DLE equipment slots to provide LFACS assignment capability	Text	18	LEIM, LFACS
DSX Assignment	DS1 Termination location	Text	4	LEIM

8.11 Fiber Splice

Data Definition	Description	Data Type	Max Char.	Source (Primary, Secondary)
Default Splice Type	System determined splice type			
Field Verified Splice Type	The actual type of splice used based on field verification			
System Determined Loss	Default loss associated with			
Field Verified Loss	The actual loss based on field verification			
Source	IPID# and complement which is on the CO side of the splice			
Destination	IPID# and complement which is on the field side of the splice			

8.12 Switch

Data Definition	Description	Data Type	Max Char.	Source (Primary, Secondary)
System Type	Manufacturer Code	Text	6	LEIM
DSX Assignment	DS1 Termination location	Text	4	LEIM

8.13 Repeater Shelf

Data Definition	Description	Date Type	Max Char.	Source (Primary, Secondary)
DSX Assignment	DS1 Termination location	Text	6	LEIM, TIRKS
Shelf Assignment (Circuit)	DS1 or DS3 Circuit ID	Text	25	LEIM, TIRKS
Shelf Capacity	Number of slots in a shelf	Text	3	LEIM, TIRKS

8.14 Fiber Strand

Data Definition	Description	Date Type	Max Char.	Source (Primary, Secondary)
Designation	Name that uniquely identifies a fiber strand inside a wire center	Text	20	FAS, LEIM, personal notes
Diversity	Diverse, Non-Diverse	Text	1	FAS
Fiber Mode	Size of strand code - single or multi-mode	Text	6	FAS
Continuity Relation	State of one item's connection to another	Graphical	N/A	FAS
Terminating Condition	Strand state of termination or non-termination	Graphical	N/A	FAS, LEIM, TIRKS
Type	Department of ownership - Loop or IOP	Text	4	FAS
Beginning Wire Center Name	Name given to a geographic area served by a central office	Text	20	FAS, LEIM, TIRKS
Terminating Wire Center Name	Name given to a geographic area served by a central office	Text	20	FAS, LEIM, TIRKS
Central Office Location	Street Address of CO	Text + Graphical	30	FAS, LEIM, TIRKS
Central Office ID	CO CLLI Code	Text	25	LEIM, TIRKS
RT Location	Strand address of Remote Terminal and Graphical Location	Text + Graphical	30	FAS, LEIM, TIRKS
Position in ribbon or tube	Position noted by Strand Color	Text	10	FAS
Wavelength	Wavelengths utilized by strand	Text	10	TIRKS
Sheath Assignment	Sheath attributes associated with the strand	Text	10	FAS
Status	Assignment condition - working, assigned, spare, planned	Text	10	LEIM, TIRKS, personal notes
Dry Fiber Indicator	Indicates whether fiber is a "dry fiber" or not	Text	1	LEIM, TIRKS

8.15 Fiber Sheath

Data Definition	Description	Date Type	Max Char.	Source (Primary, Secondary)
Manufacturer	Sheath manufacturer	Text	10	FAS
Fiber Type	Cable Core Design	Text	20	FAS
Fiber Mode	Core Size	Text	6	FAS
Attenuation	Expected attenuation (signal loss) of strand	Text	8	FAS
Sheath Type	Over sheath attributes	Text	20	FAS
Tensile Load	Maximum allowable sheath tension	Text	10	FAS
Cable unit type	Configuration of fibers in sheath tube or ribbon	Text	10	FAS
Fibers per unit	Number of guaranteed fibers in sheath units	Text	3	FAS
Size	Number of Fibers	Numeric	4	FAS
IPID #	Item of plant ID in FAS	Numeric	10	FAS
Mortality Date	Year placed in field	Date	4	FAS
Designation	Type or use of fiber - outside, riser, plenum	Text	10	FAS
Reduced Water Peak (RWP) fiber type	Sheath property for new cables	Text	4	FAS

-continued

Data Definition	Description	Date Type	Max Char.	Source (Primary, Secondary)
Length	Sheath length	Numeric	8	FAS; records measurement associated with fiber splice
Environment	Sheath environment as described by FRC	Text	6	FAS
Status	Assignment condition - working, assigned, spare, planned	Text	10	LEIM, TIRKS, Personal Notes

8.16 Equipment Location

Data Definition	Description	Date Type	Max Char.	Source (Primary, Secondary)
District Name	District location resides in	Text	25	LEIM, FAS
Address	Street Address of location	Text	30	LEIM, FAS
Area #	Code the uniquely identifies address	Text	6	LEIM, FAS
Location #	RT and CLLI #	Text	15	LEIM
Structure Type	Type of structure to house DLE	Text	8	LEIM, FAS

8.17 Conduit

Data Definition	Description	Date Type	Max Char.	Source (Primary, Secondary)
Conduit Run	Group of conduits traversing same route	N/A	N/A	N/A
Conduit Type	Material description of conduit	Text	15	FAS, personal notes
Conduit Location	Graphical location of Conduit run	Graphical	N/A	FAS
Conduit length	End to end length of conduit to the nearest foot	Numeric	8	FAS
Manhole name	Name assigned to manhole	Text	8	FAS
Manhole locations	Graphical location of manhole	Graphical	N/A	FAS
Hand hole name	Name assigned to manhole	Text	5	FAS

9 Use Case Modeling

Purpose: The purpose of this section is to provide a high-level understanding of core system functionality, both user and machine-driven, for FMT.

Discussion: Use-Case diagramming is a simple modeling technique that illustrates the various entities—human and machine (called "Actors")—that can interact with the proposed system. Use-Case diagrams provide a high-level, graphical summary of embodiments and are also useful during the development phase for defining objects in a system.

9.1 Use Case Descriptions

9.1.1 Use Case: Login and Password

9.1.1.1 Description

This use case describes how a user logs into the system. The user needs a valid username and password, which is created by the system administrator. When the user logs in with the correct username and password, the system recognizes the user and sets their appropriate permissions and preferences.

9.1.1.2 Actors

Facility Planners

Engineering Assistants

Transmission Engineers

Construction Technicians

Long Term Planners

OSP Engineers

9.1.1.3 Normal Sequence

Sequence Number	Description
1.	The user double-clicks an icon or a selection from the Windows NT Start Menu and launches the application.
2.	The user enters a CUID (Common User Id) and Password.
3.	The application determines the user's role type (Loop Capacity Manager, Engineering Assistant, etc.) and default District and makes appropriate functionality available.
4.	User enters the system with their default settings

9.1.1.4 Alternative Sequence

The user forgets his/her password or enters the wrong password. The system can prompt the user to reenter the password. If the user has forgotten his/her password, they can have to contact the system administrator to reset password.

9.2.2 Use Case: Search/Find, View Graphical Elements

9.2.2.1 Description

This use case allows the user to search/find or view graphical elements from within the system. The user can input a

search with/without a wildcard or select from a list what they would like to view. The user may also narrow or refine their search to obtain additional information about the search.

9.2.2.2 Actors

Facility Planners

Engineering Assistants

Transmission Engineers

Construction Technicians

Long Term Planners

OSP Engineers

9.2.2.3 Normal Sequence

Sequence Number	Description
1.	User logs into system (see use case: 9.1.1)
2.	User inputs a fiber name, or a part of a fiber name with a wildcard. The application accepts the query and returns a diagram or tabular data based on user's request of the fiber ring from the originating Central Office.
3.	The user "Zooms In" or "Zooms Out" as needed. The system can display more geographic and infra-structure detail when the users "Zoom In" and less detail when they "Zoom Out."
4.	The user selects a feature and the application returns a pop-up window with detailed information about the feature.
5.	The user selects an "Additional Info" option to drill down for additional data on the feature.
6.	The user can print, change focus to another application on the desktop (ALT-TAB for example), re-query or close the window.

9.2.2.4 Alternate Sequences

The user enters a query based on: equipment type constrained by Central Office (Wire Center), remote terminal (which returns all equipment), fiber sheath, or street address. The returned diagram can support zoom in and zoom out features. If the equipment has data associated with it in more than one external system, the returned data window can show the discrepancies. FIG. **12** suggests the concept.

9.2.3 Use Case: Query Network Facility Items

9.2.3.1 Description

This use case allows the user to query network facility items from within the system. The system allows the user to search with multiple parameters and wildcards. The user can also narrow the query and view an item by type, date, etc.

9.2.3.2 Actors

Facility Planners

Engineering Assistants

Transmission Engineers

Construction Technicians

Long Term Planners

OSP Engineers

9.2.3.3 Normal Sequence

Sequence Number	Description
1.	User logs in (see use case: 9.1.1)
2.	On the query screen, the system can provide multiple parameters for a search. For example, a user may want to view fiber sheath(s) by Manufacturer, Type, and Year Placed.
3.	The user can be able to further narrow the search. For example, a user enters Manufacturer and Year Placed as parameters, and FMT displays a listing of all sheaths meeting the criteria.
4.	User selects an individual facility item to review its data attributes
5.	User can select another item or log out

9.2.3.4 Alternative Sequence

The user may misspell a word or leave out part of a word. The system should query for words that are similar to the one entered by the user. If no data exists for the parameters entered, the system should prompt the user to try another search.

9.2.4 Use Case: Provide Calculation Tools

9.2.4.1 Description

This use case allows the user to obtain calculations from the system by entering criteria into the system or selecting areas or items to be calculated. The system has calculation tools that it uses in the backend to perform such activities. The user may view the calculation graphically or in a tabular format.

9.2.4.2 Actors

Facility Planners

Engineering Assistants

Transmission Engineers

Construction Technicians

Long Term Planners

OSP Engineers

9.2.4.3 Normal Sequence

Sequence Number	Description
1.	User logs in (see use case: 9.1.1)
2.	On the main screen, the user selects what they want calculated or measured
3.	A user may select points graphically, manually input locations, etc. and the system can use the appropriate tool and display the output for the user
4.	The user may input other variables or criteria to obtain other calculations, etc.
5.	Once the user is done he logs out of the system

9.2.4.4 Alternative Sequence

The user may enter a wrong spelling of a word when entering search criteria or select an invalid area on map. The system can prompt the user to try again. The user may want to calculate multiple point distances from the map.

9.2.5.1 Use Case: Integrate Fiber Related Data

9.2.5.1 Description

This use case allows the user to obtain data that is stored in external systems or in the system's database. The system pulls data from external system and integrates it to display an output for the user.

9.2.5.2 Actors

Facility Planners
Engineering Assistants
Transmission Engineers
Construction Technicians
Long Term Planners
OSP Engineers

9.2.5.3 Normal Sequence

Sequence Number	Description
1.	User logs in (see use case: 9.1.1)
2.	The system can provide the user with the ability to select in a graphical environment or on a query screen, and view results in a tabular format.
3.	On the main screen, the user selects an item on a query screen or chooses one from a list or select one from the items currently visible.
4.	The user may input other variables or criteria to obtain other more detailed information, etc.
5.	The system obtains the appropriate data from external systems and/or its database in the backend and displays the output for the user to view.
6.	The user views the data and may do another search or refine the search further.
7.	User logs out when finished.

9.2.5.4 Alternative Sequence

The user may enter a search criterion that is not valid or not recognized by the system. The data may not have been integrated from the external systems into the main system, FMT. The system can then display on screen a message that data entered is not recognized by the system, please try again.

9.2.6 Use Case: Provide Fiber Tools and Reports

9.2.6.1 Description

This use case provides user to use tools and view reports generated by the system. The system contains fiber tools that help the user in determining status, priority, or other information about fiber.

9.2.6.2 Actors

Facility Planners
Engineering Assistants
Transmission Engineers
Construction Technicians
Long Term Planners
OSP Engineers

9.2.6.3 Normal Sequence

Sequence Number	Description
1.	User logs in (see use case: 9.1.1)
2.	On the main screen, the system provides various tools for the user to use.
3.	User selects a tool in order to perform a certain function to a fiber, fiber strand, etc. such as assign reservation status, restoration priority, fiber strand diversity.
4.	The system assigns the value appropriately to the fiber according to what the user indicated.
5.	The user also may print out or view a report about the fiber, etc.
6.	User logs out when finished.

9.2.6.4 Alternative Sequence

The user may select the wrong tool to assign value to fibers. The system can allow the user to make changes and can ask the user for a confirmation on the changes made. These changes or additions can vary on user permissions.

9.2.7 Use Case: Create, Read, Update, Delete LRS

9.2.7.1 Description

This use case allows user to go into the planning part of FMT. Users can be able to create, read, update, and delete location relief strategies. The functions they can perform can depend on the privileges and permissions that they have according to the login.

9.2.7.2 Actors

Facility Planners
Engineering Assistants
Long Term Planners

9.2.7.3 Normal Sequence

Sequence Number	Description
1.	User logs in to system (see use case: 9.1.1)
2.	User launches Location Relief Strategy with menu item or toolbar button.
3.	User selects the activity they would like to perform (create, read, update, etc.)
4.	The system opens a LRS or allows user to create a new Location Relief Strategy.
5.	User selects a Central Office or area of interest on the District map and "Zooms In"
6.	The user selects symbols, lines from an object palette and draws the design.
7.	User enters comments in comment fields for each object placed on the diagram.
8.	User saves design and selects a "Publish" or "Private" option. The Publish option can make the design available to other users with access to the planning layer.
9.	User logs off when finished.

9.2.7.4 Alternate Sequences

The user may choose to delete or update a LRS, but not have permission to do so. The system can display a message that the user does not have permission o do the task selected. The user may add comments about the LRS that can be seen by the creator of the LRS and anyone else who has access.

9.2.8 Use Case: View Cross Box Data for Planning

9.2.8.1 Description

This use case allows user to get information about cross boxes in order to use it for planning purposes. The user can be able to do a search or query on cross boxes by date and attach the output data to the LRS they create. This data can used for Location Relief Strategies.

9.2.8.2 Actors

Facility Planners

Engineering Assistants

Long Term Planners

9.2.8.3 Normal Sequence

Sequence Number	Description
1.	User logs in (see use case: 9.1.1)
2.	On the main screen, the user can select cross box data.
3.	User can enter search date parameters for the system to check cross box fills, etc. for the dates specified.
4.	The system can display in graphical and tabular form the cross box data.
5.	User can have the option to attach this data to the LRS that the user can create. If it is attached to the LRS, then anyone who can view the LRS can be able to view the cross box data.
6.	User does a search for a LRS
7.	User associates LRS with Cross Box data
8.	User logs out when completed.

9.2.8.4 Alternative Sequence

The user may want to attach more than one cross box report. The system can allow the user to attach additional reports for each LRS created.

10 Technical

Purpose: This section defines the scope of the architectural platform and the subset of standards applicable to OPEDS Software development. This section can also reference security and other development standards.

10.1 General

A standards based approach to software development may be designed to promote high data integrity, open systems, improved responsiveness to user functionality changes, enhanced reliability and availability, and security of corporate resources, economic efficiency, and scaleable, distributed systems. This section can define the overall scope of the architectural platform and the subset of standards applicable to OPEDS software development. Included can be an overview of the current OPEDS application and infrastructure architectures. This section can also reference security and other development standards.

10.2 Computing Architecture

Technical Reference 73579 Standards can be used in the design, implementation and management of software modules that form an information network. The industry standards for languages, protocol services, interfaces, computer models, etc. may be used. These standards also form the yardstick by which Commercial Off The Shelf (COTS) or prepackaged software applications are considered for deployment. Other conventional computing architectures may be used.

10.3 Computer Asset Protection Guidelines

The Corporate Security Standards practices may be provided.

10.4 SDLC

System Development Life Cycle is a repeatable, corporate-endorsed development methodology that is followed for internally developed systems or major enhancement to an existing system. FIG. **13** depicts the System Development Life Cycle.

10.5 Other Standards and Guides

10.5.1 GUI Style Guide

Not applicable.

10.5.2 Capability Maturity Model (CMM)

The CMM is an industry-accepted model for software development processes and was developed by the Software Engineering Institute (SEI) at Carnegie Mellon University.

10.5.3 Metrics

Each application, regardless of the SDLC methodology being followed, may collect primitive metrics to be used as an aid in the effective management and maintenance of software. Primitive metrics are those measures that are applicable to any application, regardless of the hardware or software involved. SLIM (Software Life Cycle Management) and SLIM-Control are the tools used to predict and track project defects. Primitive metrics include but are not limited to the following:

1. Size of the project in function points
2. Lines of Code, by type
3. Time to complete the project (broad measure of staff hours)
4. Number of defects originating in each SDLC phase

10.5.4 Configuration Management

A configuration management tool may be used for control of managed/on-site developed software. IBM's CMVC (Configuration Management Version Control) system is currently (circa 1999) used by OPEDS for all software and documentation to manage versions and configurations. COTS or custom code developed at a supplier's facility must be managed by the supplier's configuration management system.

10.6 Technical Design

10.6.1 Design

OPEDS uses a multi-tier architecture. OPEDS is modular in design to promote reuse of system service components. Business logic is accessible through application services. Application services are independently executable. Application services shall be capable of being independently authorized. OPEDS can be modular in design to allow for the addition of new features (e.g., objects and methods) without a need to alter existing functionality.

10.6.2 Open Systems

The system may be compliant with open system standards.

10.6.3 Open APIs

OPEDS shall use an Open API (or Middleware) to provide connection management to:

- Client/presentation layer (e.g., Windows Client, WEB Browser)
- Business processing layer
- External interfaces
- Reporting elements (e.g. COTS reporting tool)
- Database elements. This can exclude Database Administrator updates to system-related data, but not user-related data.

10.6.4 Interfaces

Communications with external systems and inter-application data transfers can use standard technology.

10.6.5 PC Client Data Access

CORBA 2.0 (ORBIX) compliant software can be the primary middleware product for accessing data from a Windows-NT based client. ODBC, INET, and/or SQLNet can be a secondary option for limited special use situations.

10.6.6 Portability

The system can be designed so as to provide for platform portability with minimal change (i.e. Windows NT platform to a UNIX platform, or between UNIX platforms.).

10.6.7 Software Development Tools

For custom developed software, the software development tools can be consistent with a Software Development Tool Approved Products List.

10.6.8 Naming Conventions

For custom developed software, the supplier can use naming and coding conventions that are consistent with standards.

10.6.9 Information Modeling

Any information modeling tools used by external suppliers can be industry standards.

10.6.10 Data

The integrity of any replicated database(s) should be maintained on an as close to real-time basis as feasible. Synchronization of a replicated database may not affect the user.

10.6.11 Data Movement

Data transfer between data stores can use middleware that minimizes the amount of human interaction required to set up and monitor the event. Consistent and reliable data can be available for inquiry in a timely manner. An accurate and reliable log of all data transfers between data stores to support an effective audit trail and ensure data integrity can be fully implemented.

Specific transfer methods can be utilized as follows:

Low volume transfers that do not require automation can utilize ftp.

High volume transfers can utilize Sterling Connect: Direct for inter-company transfers and BUFIT for intra-company transfers.

Database to like database transfers should utilize native transfer modes (i.e. SQLNet).

10.6.12 User Interface Design

Data entry screens should be designed so that users are not required to enter the same data more than once. For example, as an OPEDS user moves from screen to screen (i.e., parent-child screens), OPEDS can automatically retrieve data for fields, which exist in both screens from the previous screen and populate the fields in the current screen. OPEDS shall provide a single sign-on Graphical User Interface (GUI) for end-user access and end-user application administration (i.e., defining activation scripts, modifying tables). The GUI display can be Windows-NT based, consistent in icon usage and color assignment, consistent in placement of buttons and menus, consistent in its look and feel, and consistent in presentation of choices to the user provided via pick lists, pull downs, or pop up menus. The system can perform dynamic validation of all user input.

10.6.13 On-Line Help

OPEDS can provide on-line help.

10.6.14 Security Embodiments

Corporate Security Standards practices, should be met.

10.6.15 User Identification

User identification can be a CUID (Common User ID).

10.6.16 Security Audit

Security audits can be performed in accordance with Corporate Security Standards practices.

10.6.17 Operations

OPEDS can be designed to support high availability. OPEDS shall have the capability to be initialized/terminated by manual input or automated script. Each application service can be documented in the context of appropriate libraries. OPEDS shall retain a log of all activation events. OPEDS can provide the capability for daily removal of all completed activation's from the on-line database and for sending them to an archive (i.e., a non-OLTP database, data warehouse database). OPEDS can be remotely administered. A single point of administration, per domain, shall be provided to manage CUIDs and passwords.

10.6.18 Backup and Recovery

All corporate data can be backed up.

10.6.19 Application Management

OPEDS can support application management:

Administration (TA Unicenter)

Performance (BEST1)

Software Distribution (DDS for UNIX, and WinDSS for Windows-NT based clients with later migration to SMS (System Management Services) for Windows-NT based clients)

Database (TA Unicenter)

10.6.20 Error Resolution

10.6.20.1 Client Application/User Errors

OPEDS client software can display error-messages on-screen and provide a meaningful nomenclature for notification and resolution.

10.6.20.2 Technical Errors

A standard process may be used to log error messages within the OPEDS server-side computing environment. The supplier can use this process to log errors and provide a meaningful nomenclature for error messages and their resolution.

10.6.21 Timing Embodiments

The system can be designed to insure presentation layer (i.e. GUI) response times for non-background processes in a range that does not exceed performance thresholds specified in the embodiments documentation as measured from the time of the user keystroke entry to the time of the system response to that entry.

10.6.22 Load Projections

At the completion of the design phase, the supplier can be responsible for projecting the CPU, memory, and DASD (Direct Access Storage Device) embodiments for each system platform (client, application server, database server).

10.6.23 Software Delivery

OPEDS software may have version control. Software received shall include release notes as delineated in the OPEDS Definition of Deliverables and a summary of new features or software fixes since the last version. Received OPEDS software shall include release installation, transition and/or data conversion notes as well as fallback procedures.

10.6.24 Work Center Application Integration Group

The supplier can be responsible for working with the Work Center Application Integration group to provide any and all variables and processes required to configure and administer the system including specifying the necessary environment levels, product levels, component levels, patch levels, etc. upon which their product must operate.

10.7 Current OPEDS Architecture

10.7.1 Overview

OPEDS is a distributed system that can run in more than 30 Telecommunication Company's districts and in a corporate environment. The Process/Data Management layer is provided by the OPEDS project. In general, client-side user interfaces communicate with the OPEDS Process/Data Management layer. Orbix, a commercial product that provides a CORBA-compliant interface to the OPEDS Process/Data management layer, is used for this communication.

In general data retrieval can fall into two categories:

10.7.1.1 External System Data

The OPEDS Process/Data management layer can manage data supplied by External Systems and master data maintained in OPEDS. OPEDS client software has access to External Systems data through an API (Application Programming Interface) provided by OPEDS.

10.7.1.2 OPEDS

Some applications retrieve data directly from OPEDS such as graphics, land and facility attribute data.

10.7.2 Workstation Specifications

The OPEDS clients can, for example, run on PCs that meet the minimum following criteria:

166 Pentium Mhz Processor

32 megabytes of RAM, at minimum (64 megabytes is the norm)

The Outside Plant (OSP) NT Workstation baseload

Windows 32-bit API compliant (16 bit applications are NOT permitted)

10.7.3 Server/Database Specifications

Any server-side code can run in the currently deployed OPEDS versions of HP-Unix 11.X and Oracle 8.X. In addition, the code can run in a high-availability environment (i.e., HP's Service Guard). There are two classes of servers:

1) Local Server

Local application servers are UNIX-based HP servers running HP/UX. Software should be developed so as to minimize work when migrating to new OS release levels. Local servers provide database, application and file/print services.

2) Data Center Servers

Two types of data center servers exist for OPEDS: corporate database servers and an archive server. The OPEDS corporate database systems are implemented on a UNIX operating system and deployed on an HP hardware platform. These data center servers can be the central database repositories. Data Stores Oracle has been chosen as the primary relational data store for OPEDS data.

10.7.4 System Diagram

FIG. **14** depicts the three-tier architecture with external systems.

10.8 Computing Architecture

10.8.1 OPEDS Data Repositories

OPEDS currently has two repositories for land and facility data:

10.8.1.1 Landbase

The landbase data model is mastered in ESRI's (Environmental Systems Research Institute, Inc.) SDE (Spatial Data Engine) format. The landbase model also stores redundant graphical facility data mastered in facilities (see below). Specifications of the landbase model are available upon request.

10.8.1.2 Facilities

The OPEDS facilities data model comprises data in Oracle, as well as graphical files on a central server. The graphics files are in Microstation .DGN format. Facilities graphics information for a given area is stored in a .DGN file; corresponding land information is stored in a .LND file.

Specifications of the Facilities model are available upon request.

10.8.2 Network Information Services

NIS is used to provide consistency and synchronization of UNIX system files across a homogeneous environment. The NIS domains are unique per district server environment with the Job Management Server acting as the NIS domain master server and all of the other district UNIX servers acting as secondary or slave NIS servers.

10.8.3 Domain Name System (DNS)

The Domain Name System (DNS) is a distributed database that runs on Regional Data Center UNIX hosts, providing a hierarchical naming system for identifying hosts on BOSIP (Open Systems Interconnect Platform). The key embodiment for OPEDS applications is to use DNS to resolve host names stored in OPEDS configuration files. OPEDS applications cannot store IP addresses in configuration files and can only store host names. This can facilitate redirecting clients to alternate servers in failure situations. NetManage TCP/IP software can be configured to utilize DNS to support OPEDS node name resolution.

10.8.4 OPEDS Process/Data Management Layer

The OPEDS Process/Data Management Layer provides access to data located on various application and data servers. This service can provide contract and messaging API(s) to directly access legacy data systems where available and provide access to intermediate service providers to legacy systems as well. These service providers can provide a variety of services including terminal emulation access to legacy 3270-based systems.

10.8.5 Wide Area Network

The Outside Plant networking environment consists of LANs interconnected to form a Wide Area Network (WAN) via BOSIP. In addition, access is provided to the Virtual Circuit Switch Network (VCSN). The goal is to provide the users with transparent and reliable access to all essential OSP systems as well as to legacy systems.

In the OPEDS architecture, BOSIP is the backbone upon which the majority of data communication relies. BOSIP is a Transmission Control Protocol/Internet Protocol (TCP/IP) based network, which fully supports distributed computing as outlined in the BSCA strategy. The design goal is to provide universal communication services independent of the underlying physical network. OPEDS utilizes the TCP/IP protocol.

10.8.6 External System Data

The OPEDS Process/Data management layer can manage data supplied by External Systems and master data maintained in OPEDS. OPEDS clients have access to the External Systems data through an API (Application Programming Interface) provided by OPEDS.

10.9 OPEDS Topology

FIG. **15** depicts an OPEDS topology.

10.9.1 Data Center

A data center is shown in FIG. **16**.

The OPEDS Corporate Data Stores for facilities and land are located in the Charlotte Data Center. The archive server and storage are located in the Data Center as well. OSPCM and legacy systems are located in all production data centers.

10.9.2 Typical District/RLAC

FIG. **17** depicts a District/RLAC.

11 Reference Items

11.1 Glossary of Terms for the FMT and Systems

Asynchronous Digital Subscriber Line	
Description:	Digital communications services available over twisted pair copper lines.
Assignment Data	
Description:	Data generally associated with the location of fiber terminations, and the MUXs the fibers are traveling through.
CO	Central Office
Description:	Central location where all facilities inside a wire center terminate.
CUID	Common User ID
Description:	The 7-character unique user id for all FMT Users.
DLE	Digital Loop Electronics

-continued

Description:	Digital transmission equipment used to generate DSO, DS1 and DS3 signals etc.
EWO	Engineering Work Order
Description:	OSP authorization to perform construction work activity.
FITL	Fiber in the Loop
Description:	Communication platform that uses fiber to deliver services to the customer's curb.
FMT	Fiber Management Tool
Description:	The proposed module of OPEDS that is the focus of this document.
FOX	The Fiber Optic Xconnect system
Description:	A system used by Inter-Office planners to track of Multiplexer (MUX)/LGX assignments.
HW	Hardwired
Description:	DLE equipment in place, but not active
IOF	InterOffice Planner
Description:	Planner responsible for planning and administering facilities between Central Offices.
IP	Long Term Planner
Description:	Planner that performs high-level district fiber optic route planning.
IPID	Item of Plant Identification
Description:	Capitalized material identification number.
LATA	Local Access Toll Area
Description:	Local calling area controlled by local access provider.
FACILITY PLANNERS	Loop Capacity Manager
Description:	Planner Responsible for non-Central Office locations and facilities.
LEIM	The Loop Equipment Inventory Module
Description:	The corporate repository of OSP Digital Loop Electronic data.
LFACS	The Loop Facility Assignment Control System
Description:	The system used to monitor and assign facilities. The system monitors the copper network, but also has fiber and equipment information. LFACS stores fiber assignment information for some, but not all, Wire Centers. The data in LFACS mirrors the data in LEIM.
LGX	Light Guide Cross Connect
Description:	Termination equipment for fiber optic cables and jumpers.
LMU	Loop Make Up
Description:	Loop distance and cable characteristics associated with a specific cable pair.
MUX	Multiplexer
Description:	DLE equipment used to aggregate or segregate digital signals.
NMLI	Native Mode LAN Interconnection
Description:	MUX and fiber connections between LANS
ONU	Optical Node Unit
Description:	OSP termination point for FITL distribution fiber at the customer's location.
OPEDS	Outside Plant Engineering Design System
Description:	A system Outside Plant facilities and landbase.
OSP	Outside Plant Engineer
Description:	Engineers responsible for all facilities not in a Central Office.
OTDR	Optical Time Domain Reflectometer
Description:	Equipment used to test fiber spans with an optical test.

-continued

PG	Pair Gain
Description:	Designation assigned to DS0 counts derived by DLE.
RSDC	Regional Design Source Code
Description:	Code used to order DLE equipment via OSPCM (Outside Plant Construction Management System) instead of TEO.
ROW	Right of Way
Description:	Municipal-owned property associated with public infrastructure.
RT	Remote Terminal
Description:	DLE location outside of a central office.
SCID	Sonet Circuit Identification
Description:	Unique identification given to SONET systems.
SONET	Synchronous Optical Network
Description:	A type of fiber optic network that requires the two endpoints to synchronize data transmission.
TEO	Telephone Equipment Order
Description:	Form used to order DLE from outside company.
TIRKS	Trunks Inventory Record Keeping System
Description:	The corporate repository of InterOffice digital equipment and digital circuits.

12 Further Details with Respect to Methods, Systems and Computer Program Products for Planning Resources Based on Primary and Alternate Location Relief Strategies

FMTs and systems for planning resources based on location relief strategies have been described above in accordance with some embodiments of the present invention. This section more generally describes the methods, systems and computer program products for planning resources based on primary and alternate location relief strategies according to some other embodiments of the present invention.

FIG. **18** is a block diagram of a resource planning system **100** and associated methods and computer program products in accordance with some embodiments of the present invention. The data processing system **100** typically includes input device(s) **132** such as a keyboard or keypad, a display **134**, and a memory **136** that communicate with a processor **138** via an address/data bus **148**. The processor **138** can be any commercially available or custom microprocessor. The data processing system **100** may further include a speaker **144** and I/O data ports **146** that also communicate with the processor **138**. The I/O data ports **146** can be used to transfer information between the data processing system **100** and another computer system and/or a network. These components may be conventional components, such as those used in many conventional data processing systems, which may be configured to operate as described herein.

The memory **136** is representative of the overall hierarchy of memory devices containing the software and data used to implement the functionality of the resource planning system **100**. As shown in FIG. **18**, the memory **136** may include several categories of software and data used in the resource planning system **100**: an operating system **152**; application programs **154**; input/output (I/O) device drivers **158**; and data **156**. As will be appreciated by those of skill in the art, the operating system **152** may be any operating system suitable for use with a resource planning system, such as OS/2, AIX, System390 or Z/OS from International Business Machines Corporation, Armonk, N.Y., Windows95, Windows98, Windows2000 or WindowsXP from Microsoft Corporation, Redmond, Wash., Unix or Linux. The I/O device drivers **158**

typically include software routines accessed through the operating system **152** by the application programs **154** to communicate with devices such as the I/O data port(s) **146** and certain memory **136** components. The application programs **154** are illustrative of the programs that implement the various features of the resource planning system **100** and preferably include at least one application which supports operations according to embodiments of the present invention. Finally, the data **156** represents the static and dynamic data used by the application programs **154**, the operating system **152**, the I/O device drivers **158**, and other software programs that may reside in the memory **136**.

As is further seen in FIG. **18**, the data **156** can include data sets that define resources **160**, geographic information **162**, and location relief strategy plans **164**, and that may also define resource needs data sets **166**. The geographic information data **162** may define roads, buildings, and/or topographical information, such as was discussed above. The resource data **160** may define the location, type, number, performance, cost, availability and/or other characteristics of resources, such as was discussed above. The defined resources may include, but not be limited to, central offices and fiber optic and electrical communication lines. The resource data **160** may define where resources are presently located relative to the geographic information data.

The resource needs data sets **166** may define one or more resource capacity needs that are associated with geographic locations. For example, one of the resource needs data sets **166** may define a number of communication lines and/or communication bandwidth that is presently needed or projected to be needed at a defined geographic location. The term "location" as used herein can include a defined geographic point, such as a mail address or latitude and longitude coordinates, and can also include a geographic area. The LRS plan data sets **164** may define one or more LRS plans that are associated with each of the resource needs data sets **166**. For example, one of the LRS plan data sets **164** may define a number of resources, such as resources for carrying telecommunications (e.g., fiber optic communication lines and/or electrical communication lines), gas lines, water lines, cable television lines, and/or electrical lines, that may be installed and/or retired at a geographic location on a defined date in an attempt to satisfy the resource needs defined by one of the resource needs data sets **166**.

More than one of the LRS plan data sets **164** may be associated with one of the resource needs data sets **166**. When more than one of the LRS plan data sets **164** are associated with one of the resource needs data sets **166**, one of them may be defined as a primary LRS plan and the others may be defined as an alternate LRS plan. The primary LRS plan may correspond to what a Long Term Planner perceives as a preferred way of satisfying the associated resource need, while the alternate LRS plans may correspond to what are perceived as less preferred ways. Accordingly, a preferred LRS plan and one or more alternate LRS plans may be defined in the LRS plan data sets **164** and associated with each resource need defined in the resource needs data sets **166**. Such association of preferred LRS plan and alternate LRS plans with a resource need may allow a Long Term Planner to define many different resource plans for meeting a resource need, and to designate a preferred resource plan while maintaining the other LRS plans for further use (e.g., documentation and/or analysis).

The application programs **154** can include a resource planning application **170**, which may include a database **172**. Although the database application **172** is illustrated as part of the resource planning application **170**, for purposes of illustration only, in some other embodiments of the present invention the functionality of the database application **172** may be at least partially outside the resource planning application **172**. The database application **172** may be any conventional database application that performs conventional data functions such as, for example, Oracle, Microsoft Access, or a custom database application. The resource planning application **170** can import data sets, including existing resource, geographic data, LRS plans, and/or resource needs, from the data portion **156** of the memory **136** into the database **172**.

The resource planning application **170** can be one or more GIS tools that can allow a planner to define and associate resources with geographic features in digitized maps. The resource planning application **170** may allow a user to at least partially define and/or evaluate the resources **160**, the geographic information **162**, the resource needs **166**, and/or the location relief strategy plan **164**. For example, the resource planning application **170** may allow a user to associate one more LRS plans **164** with one of the resource needs **166**, and to define which of the associated LRS plans **164** is a primary LRS plan and/or which are alternate LRS plans. When a plurality of the LRS plans are associated with a resource need, the LRS plans may be prioritized (e.g., ranked). A highest priority one of the LRS plans may then be defined as a primary LRS plan, and the other LRS plan(s) may be defined as alternate LRS plans. In some embodiments of the present invention, only one of the LRS plans **164** that are associated with one of the resource needs **166** can be defined as a primary LRS plan.

The resource planning application **170** also generates a resource plan based on the primary LRS plan and/or the alternate LRS plan. The generated resource plan may be generated by, for example, displaying on the display **134** the resources that presently exist in a defined geographical area, as defined by the resource data sets **160**, and the primary LRS plan and/or alternate LRS plan. The displayed resources and plans may be overlaid on a map formed by a relevant potion of the geographical information data **162**. A resource planner or other user may use the input devices **132** to select which of the LRS plans **164** are included in the resource plan. For example, a resource plan may be generated based on the primary LRS plans, or it may be generated based on selected ones of the primary LRS plans and/or alternate LRS plans. A user may also define access privileges for the LRS plans, such as public or private, which may be used by the resource planning application **170** to limit access of one or more of the LRS plans to users who satisfy the defined access privileges.

The resource planning application **170** may generate a resource plan that combines all or selected ones of the primary LRS plans and/or alternate LRS plans for more than one of the defined resource needs **166**, and/or the resource planning application **170** may generate a different resource plan for each of the defined resource needs **166**.

Reference is now made to FIG. **19**, which illustrates existing resources and two resource needs **220** and **230** as they may be displayed by a resource planning system according to some embodiments of the present invention. The existing resources include two central offices (COs) **202** and **204** and electrical communication lines **210***a-j* that are communicatively connected to the central offices **202** and **204**. Each of the electrical communication lines **210***a-j* include defined characteristics that include a reference number (i.e., 2XXX), a planned installation date (i.e., 2004 or 2005), the number of copper pairs in the line, the gauge (i.e., thickness) of the copper pairs, and the connections between, and relative locations, of the lines **210***a-j* and the central offices **202** and **204**. Each of the resource needs **220** and **230** have been defined for a geographic position relative to the existing resources. A

user, such as a resource planner, may then use the resource planning system to define and compare LRS plans that may satisfy the defined resource needs **220** and **230**.

An example resource plan **300** is illustrated in FIG. **20** that combines the existing resources and defined primary and alternate LRS plans responsive to the resource needs **220** and **230**. One primary LRS plan **310** has been defined and associated with the resource need **220**. One primary LRS plan **320** and two alternate LRS plans **330** and **340**, which are proposed alternative plans, have been defined and associated with the other resource need **230**. The primary LRS plan **310** defines a planned connection from the communication line **210***f* to the resource need **220** in the year 2005. The primary LRS plan **320** defines a planned connection from the central office **204** to the resource need **230** in the year 2004. The alternative LRS plan **330** defines a connection from the communication line **210***h* to the resource need **230** in the year 2005, and the other alternative LRS plan **340** defines a connection from the communication line **210***b* to the resource need **230** in the year 2004.

According to some embodiments of the present invention, a user may select which of the primary and/or alternate LRS plans are to be displayed with the existing resources. For example, with reference to FIG. **21**, the resource plan **300** has been illustrated with the primary LRS plans **310** and **320** shown, and the alternative LRS plans **330** and **340** (FIG. **20**) hidden. Accordingly, a user may view only the primary LRS plans and hide any alternate plans. A user may similarly filter what information in a resource plan is displayed based on attributes that are associated with the LRS plans, such as when LRS plans are expected to be completed, whether resources associated with LRS plans are direct buried (e.g., buried in the ground without a conduit), buried within a conduit, and/or suspended on a utility pole. A user may thereby selectively view what resources can be available by a particular date and/or based on other attributes that are associated with the resources. The resource plan(s) may be overlaid on geographic information, such as the geographic maps that are illustrated and described above.

A resource management system may alternatively, or additionally, generate reports on existing and/or planned resources relative to dates and/or needs. The resource management system may also summarize the individual and/or combined characteristics of the existing and/or planned resources, including location, type, number, performance, cost, availability and/or other characteristics of resources, such as those discussed above.

A user may thereby define and/or evaluate in the resource planning system one or more resource needs, and may then define and/or compare one or more LRS plans that may be used to address the resource needs. A user may also change the designation of a LRS plan, such as from primary to alternate or vice-versa. More than one LRS plan may be associated with a resource, and the LRS plans may be relatively defined as primary and alternate plans. By maintaining the alternative LRS plans associated with a resource need, in addition to the primary LRS plans, the resource planning system may document for later use why a particular LRS plan was selected.

Although the resource planning application **170**, the database **172**, and the components of the data **156** of memory **136** are illustrated in FIG. **18** as being part of a single resource planning system **100**, as will be appreciated by those of skill in the art, the illustrated functionality and data may be distributed across one or more resource planning systems. For example, the functionality of the database **172** and the resource data **160** and geographic information data **162** may be provided on one or more resource planning systems that are separate from the resource planning system that provides the functionality of the resource planning application **170**, the local relief strategy plan data **164**, and/or resource needs data **166**. It will also be appreciated that various applications could be incorporated into some other logical division of the resource planning system **100**. Thus, the present invention should not be construed as limited to the configuration of FIG. **18**, but is intended to encompass any arrangement, division of functions between resource planning systems and/or configuration capable of carrying out the operations described herein.

Reference is now made to FIG. **22** which illustrates a flowchart of operations that may be used to planning resource according to various embodiments of the present invention. At Block **400**, existing resource that are associated with a defined geographic location are imported into the resource management application. At Block **410**, geographic information that is associated with a defined geographic location is imported into the resource management application. At Block **420**, resources needs are defined. At Block **430**, LRS plans that are defined and associated with a resource need and/or are imported into the resource management application. At Block **440**, one of the LRS plans is defined as a primary LRS plan, and, at Block **450**, other ones of the LRS plans are defined as alternate LRS plans. As will be appreciated, the defined/imported LRS plans may be defined by a default alternate/primary designation so that a user may only need to change the default designation(s) for the defined/imported LRS plans so as distinguish the primary LRS plan from the alternate LRS plans. Accordingly, Block **440** or Block **450** may thereby be eliminated in some embodiments of the present invention. At Block **460**, a user may select which LRS plans that are and/or are not to be displayed. At Block **470**, the LRS plans may be displayed with the resource need(s), the existing resources and/or the geographic information to a user. The operations **440-470** can be referred to by the dashed Block **435** as exemplary operations for generating a resource plan according to various embodiments of the present invention.

In the drawings and specification, there have been disclosed exemplary embodiments of the invention. Although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined by the following claims.

That which is claimed is:

1. A computer-based method of planning resources based on a resource need, the method comprising:

performing operations as follows on a processor;

importing into a resource planning application that executes on a resource planning system a plurality of location relief strategy plan data sets for installing and retiring apparatus resources in a defined geographic region, wherein one of the location relief strategy plan data sets is defined as a primary location relief strategy plan for installing and retiring apparatus resources in the defined geographic region and one other one of the location relief strategy plan data sets is defined as an alternate location relief strategy plan for installing and retiring apparatus resources in the defined geographic region, and the primary location relief strategy plan and the alternate location relief strategy plans are maintained in a memory of the resource planning system;

generating within the resource planning application a resource plan based on the primary location relief strategy plan and the alternate location relief strategy plan;

displaying on a display device a graphical representation of the primary location relief strategy plan overlaid on a geographic map of the defined region without displaying a graphical representation of the alternative location

relief strategy plan in response to receiving a first user input and displaying on the display device a combination of a graphical representation of the primary location relief strategy plan and a graphical representation of the alternative location relief strategy plan overlaid on the geographic map of the defined region in response to receiving a different second user input; and

initiating installation, retirement, and repair of one of the apparatus resources based on the resource plan;

wherein the apparatus resources comprise part of a network infrastructure that is to provide services for multiple entities; and

wherein initiating repair of one of the apparatus resources comprises determining a location of damage to a fiber optic asset based on the resource plan and optical time-domain reflectormeter information.

2. The method of claim **1**, further comprising:

prioritizing the location relief strategy plan data sets;

selecting the highest priority location relief strategy plan data set as the primary location relief strategy plan; and

designating the one other of the location relief strategy plan data sets as the alternate location relief strategy plan.

3. The method of claim **1**, further comprising:

changing the location relief strategy plan data set that is defined as a primary location relief strategy plan to be defined as an alternate location relief strategy plan; and

changing one of the other location relief strategy plan data sets that is defined as an alternate location relief strategy plan to be defined as a primary location relief strategy plan.

4. The method of claim **1**, wherein generating a resource plan based on the primary location relief strategy plan and the alternate location relief strategy plan comprises selectively displaying one of the primary location relief strategy plan or and the alternate location relief strategy plan based on an input selection from a user.

5. The method of claim **1**, further comprising:

importing into the resource planning application a plurality of location relief strategy plan data sets that are associated with a plurality of resource needs, wherein only one of the location relief strategy plan data sets associated with each of the resource needs is defined as the primary location relief strategy plan; and

generating within the resource planning application a resource plan for each of the resource needs based on the associated primary location relief strategy plan and the associated alternate location relief strategy plan.

6. The method of claim **5**, wherein a plurality of the location relief strategy plan data sets associated with one of the resource needs are defined as alternate location relief strategy plans.

7. The method of claim **5**, wherein generating a resource plan for each of the resource needs comprises generating each of the resource plans based only on user selected ones of the associated location relief strategy plan data sets.

8. The method of claim **5**, wherein generating a resource plan for each of the resource needs comprises generating each of the resource plans based only on the associated primary location relief strategy plans.

9. The method of claim **5**, wherein generating a resource plan for each of the resource needs comprises generating each of the resource plans based on the associated primary location relief strategy plan and user selected ones of the associated alternate location relief strategy plans.

10. The method of claim **1**, further comprising:

toggling back and forth between the displaying of the graphical representation of the primary location relief strategy plan and the displaying the combination of the graphical representation of the primary location relief strategy plan and the alternative location relief strategy plan responsive to alternating first and second user inputs.

11. The method of claim **1**, further comprising:

displaying, on the display device as an overlay on the geographic map of the defined region, the graphical representation of the primary location relief strategy plan for installing and retiring apparatus resources for carrying telecommunications in the defined geographic region without displaying a graphical representation of the alternative location relief strategy plan in response to a first user input;

displaying, on the display device as an overlay on the geographic map of the defined region, a combination of a graphical representation of the primary location relief strategy plan for installing and the retiring apparatus resources in the defined geographic region and a graphical representation of the alternative location relief strategy plan for installing and retiring the apparatus resources for carrying telecommunications in the defined geographic region in response to a different second user input; and

toggling back and forth between the displaying of the graphical representation of the primary location relief strategy plan and the displaying the combination of the graphical representation of the primary location relief strategy plan and the alternative location relief strategy plan responsive to alternating first and second user inputs.

12. The method of claim **11**, further comprising:

displaying, on the display device as an overlay on the geographic map of the defined region, the graphical representation of the primary location relief strategy plan for installing and retiring a number of fiber optic communication lines and electrical communication lines in the defined geographic region without displaying a graphical representation of the alternative location relief strategy plan in response to a first user input;

displaying, on the display device as an overlay on the geographic map of the defined region, a combination of a graphical representation of the primary location relief strategy plan for installing and retiring the number of fiber optic communication lines and electrical communication lines in the defined geographic region and a graphical representation of the alternative location relief strategy plan for installing and retiring the apparatus resources for carrying telecommunications in the defined geographic region in response to a different second user input; and

toggling back and forth between the displaying of the graphical representation of the primary location relief strategy plan and the displaying the combination of the graphical representation of the primary location relief strategy plan and the alternative location relief strategy plan responsive to alternating first and second user inputs.

13. The method of claim **1**, further comprising:

displaying, on the display device as an overlay on the geographic map of the defined region, the graphical representation of the primary location relief strategy plan for installing and retiring a number of gas lines, electrical lines, and water lines in the defined geographic region without displaying a graphical representation of the alternative location relief strategy plan in response to a first user input;

displaying, on the display device as an overlay on the geographic map of the defined region, a combination of a graphical representation of the primary location relief strategy plan for installing the number of gas lines, electrical lines, and water lines in the defined geographic region and a graphical representation of the alternative location relief strategy plan for installing and retiring apparatus resources for carrying telecommunications in the defined geographic region in response to a different second user input; and

toggling back and forth between the displaying of the graphical representation of the primary location relief strategy plan and the displaying the combination of the graphical representation of the primary location relief strategy plan and the alternative location relief strategy plan responsive to alternating first and second user inputs.

14. The method of claim **1**, wherein the primary location relief strategy plan and the alternate location relief strategy plan each correspond to a plan for installing and retiring cable television lines at a geographic location.

15. A resource planning system comprising:

a computer processor; and

a non-transitory memory comprising computer readable program code that when executed by the computer processor causes the computer processor to perform operations comprising:

importing into a resource planning application that executes on the computer processor a plurality of location relief strategy plan data sets for installing and retiring apparatus resources in a defined geographic region, wherein one of the location relief strategy plan data sets is defined as a primary location relief strategy plan for installing and retiring apparatus resources in the defined geographic region and one other one of the location relief strategy plan data sets is defined as an alternate location relief strategy plan for installing and retiring apparatus resources in the defined geographic region, and the primary location relief strategy plan and the alternate location relief strategy plans are maintained in the memory;

generating within the resource planning application a resource plan based on the primary location relief strategy plan and the alternate location relief strategy plan;

displaying on a display device a graphical representation of the primary location relief strategy plan overlaid on a geographic map of the defined region without displaying a graphical representation of the alternative location relief strategy plan in response to receiving a first user input and displaying on the display device a combination of a graphical representation of the primary location relief strategy plan and a graphical representation of the alternative location relief strategy plan overlaid on the geographic map of the defined region in response to receiving a different second user input; and

initiating installation, retirement, and repair of one of the apparatus resources based on the resource plan;

wherein the apparatus resources comprise part of a network infrastructure that is to provide services for multiple entities; and

wherein initiating repair of one of the apparatus resources comprises determining a location of damage to a fiber optic asset based on the resource plan and optical time-domain reflector information.

16. The resource planning system of claim **15**, wherein the operations further comprise:

importing into the resource planning application a plurality of location relief strategy plan data sets that are associated with a plurality of resource needs, wherein only one of the location relief strategy plan data sets associated with each of the resource needs is defined as a primary location relief strategy plan and a plurality of the location relief strategy plan data sets associated with some of the resource needs are defined as alternate location relief strategy plans; and

generating within the resource planning application a resource plan for each of the resource needs by displaying, via the display, the primary location relief strategy plan and the alternate location relief strategy plans based on a user selection signal.

17. The resource planning system of claim **16**, wherein the operations further comprise:

generating through the resource planning application a resource plan for each of the resource needs by displaying the primary location relief strategy plan and selectively displaying the alternate location relief strategy plans based on the user selection signal.

18. A computer program product for planning resources based on a resource need, the computer program product comprising program code embodied in a non-transitory computer-readable storage medium that when executed by a computer processor causes the processor to perform operations comprising:

importing into a resource planning application that executes on the computer processor a plurality of location relief strategy plan data sets for installing and retiring apparatus resources in a defined geographic region, wherein one of the location relief strategy plan data sets is defined as a primary location relief strategy plan for installing and retiring apparatus resources in the defined geographic region and one other one of the location relief strategy plan data sets is defined as an alternate location relief strategy plan for installing and retiring apparatus resources in the defined geographic region, and the primary location relief strategy plan and the alternate location relief strategy plans are maintained in a memory of the resource planning system;

generating within the resource planning application a resource plan based on the primary location relief strategy plan and the alternate location relief strategy plan;

displaying on a display device a graphical representation of the primary location relief strategy plan overlaid on a geographic map of the defined region without displaying a graphical representation of the alternative location relief strategy plan in response to receiving a first user input and displaying on the display device a combination of a graphical representation of the primary location relief strategy plan and a graphical representation of the alternative location relief strategy plan overlaid on the geographic map of the defined region in response to receiving a different second user input; and

initiating installation, retirement, and repair of one of the apparatus resources based on the resource plan;

wherein the apparatus resources comprise part of a network infrastructure that is to provide services for multiple entities; and

wherein initiating repair of one of the apparatus resources comprises determining a location of damage to a fiber optic asset based on the resource plan and optical time-domain reflectometer information.

19. The computer program product according to claim 18, wherein a plurality of the location relief strategy plan data sets that are associated with the resource need are defined as alternate location relief strategy plans, and the operations further comprise:

displaying one of the location relief strategy plans among the primary location relief strategy plan and the plurality of alternate location relief strategy plans that are associated with the resource need based on a user selection.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 9,245,241 B2
APPLICATION NO. : 10/885191
DATED : January 26, 2016
INVENTOR(S) : Mansfield et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims:

Column 107, Claim 4, Lines 34 - 35: Please correct "plan or and the"
to read -- plan and the --

Signed and Sealed this
Twenty-sixth Day of April, 2016

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office